DEC 8 1909

TELEPHONE ENGINEER

Vol. II CHICAGO, DECEMBER, 1909 No. 6

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TELEPHONE ENGINEER

VOL. II CHICAGO, DECEMBER, 1909 No. 6

PUBLISHED MONTHLY BY THE
ELECTRICITY MAGAZINE CORPORATION
MONADNOCK BUILDING, CHICAGO.
ED J. MOCK and PAUL H. WOODRUFF, Editors.
LONG DISTANCE TELEPHONE: HARRISON 3014.
EUROPEAN OFFICE.....36 Maiden Lane, Covent Garden, London
S. RENTELL & Co., Representatives.

Application made for entry as second-class matter at Chicago, Illinois, postoffice.

TERMS OF SUBSCRIPTION.

United States, Cuba and Mexico.....Per year, $2.00
Canada.....Per year, 2.50
Foreign countries within the Postal Union.....Per year, 3.00
Single Copy..... .20

DISTRIBUTING AGENTS: The Western News Company and its International Branches.

NOTICE TO ADVERTISERS.

Changes of advertising copy should reach the office of publication not less than ten days in advance of date of issue. Regular date of issue, the first day of each month. New advertisements will be accepted up to within five days of date of issue, but proof of such advertisements can not be shown until the appearance of the edition containing it.

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CHICAGO, DECEMBER, 1909.

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A. T. & T. ACQUIRES WESTERN UNION.

FORMAL announcement of the passing of the control of the Western Union Telegraph Company to the American Telephone and Telegraph Company was made November 15. It was the first sharp winter day—a suitable time for such a crisp, momentous announcement. No one, from Wall street to the remotest telephone and telegraph operator, was surprised, for the big transaction had been foreshadowed by the events of some years past, and especially so during the greater part of this year.

American Telephone and Telegraph Company was organized in 1885, with a capital of $12,000,000. Compared with the larger corporations of that day this was a rather insignificant amount. Among the organizers were Theodore N. Vail, Francis Blake, George L. Green, William Lowell Putnam, T. Jefferson Collidge, Jr., Charles W. Amory, Rudolph Ellis and others, all of Boston, who were apparently content with the telephone business in their immediate vicinity and in a sort of modest way.

It wasn't long before other systems were acquired in New York state, and later with the assistance of the Western Union Telegraph Company, the stock of the New York Telephone Company was acquired. Then the money crowd began to take notice and they have had something to see ever since.

Today the A. T. & T. Company is the parent Bell company of North America. The men having charge of the corporation are the masters of the big wire systems on the western hemisphere. The growth of American T. & T. has been marvelous. Its stock and bonds aggregate $592,475,400. Incidentally, this latest move is responsible for a new term in telephone finance, for President Vail, in confirming the purchase of his company's new acquisition, says that it had obtained a "substantial minority" of the W. U. stock.

In this instance the substantial minority means absolute control, for American T. & T. Company has purchased at a price of something near $42,500,000, the holdings of George Gould and his associates, together with those of the Sage and Morosini estates, approximating half a million shares. The Western Union Company is in brand new hands.

The Western Union Telegraph Company is the largest telegraphic system in the world, having more than a million miles of wire in the United States and Canada. It has nearly 25,000 offices, with direct connection by telegraph or telephone with as many more remote and smaller stations. It connects with seven Atlantic cables and at San Francisco with the cables of the Pacific ocean.

Speaking of the merger, President Vail of the Amer-

ican Telephone and Telegraph Company is quoted as having said:

From the very commencement of the telephone business it has been thought that a close co-operation—the making of one business the auxiliary to the other business—would give additional public service, as well as result in large economies both to the public and to the companies.

There is much to be gained by the joint construction and maintenance of plant, and by its common use to the greatest possible extent, but the greatest advantage would follow the placing of millions of telephone subscribers in close and reliable connection with the receiving and dispatching offices of the telegraph companies.

While some provision for this, after a manner exists today, a lack of harmony and co-operation between the companies and an inability to agree on methods of fixing responsibility has limited its utilization to cases of absolute necessity.

The harmony and co-operation necessary, it is believed, can now be established and the resulting advantage made available for the public.

The telegraph service is analogous to the mail service in hint it is the collection, transmission or transportation and delivery of correspondence, the difference being that the mails transport the actual communications, while the telegraph transmits the contents of the communication from office of origin to office of destination. From the collection to the delivery of the correspondence the entire work is done by the staff of the telegraph company.

The telephone, on the other hand, enables persons too distant from each other for ordinary conversation to engage in personal communication with each other by placing at their disposition for a time a telephone circuit.

While there is a common feature in the use of wires strung on poles or in cables, the similarity ends there; the circuits and methods used for the telegraph and the telephone are entirely distinct and different, and each business requires its special equipment, operating force and general business organization.

It seems not only to be good policy but a duty to increase the service and advantages to the public by utilizing present unutilized possibilities, and at the same time benefit property and increase revenue.

It is to be hoped all that President Vail has said will be confirmed. It is reasonably safe to assume that there will not be a raise of telegraphic rates. It is logical to believe that a material reduction in these rates will follow. The unquestionable economies afforded by this great consolidation will tend to lessen telegraph tolls, but they are not apt to come, if they come at all, until thorough familiarity of the working of the merged plants can be learned. A keen appreciation of the requirements of the public will develop a better service, that's sure, and that feature in itself will help to justify present prices.

It is interesting to note that thirty years ago the American Bell Telephone Company gave the Western Union Telegraph Company twenty per cent of its earnings, bought its telephone apparatus for a good sum, and agreed to stay out of the telegraph field. Since that time the telephone has so far surpassed the telegraph that the telephone interests have virtually taken possession of the most important telegraph system in the world.

OUR SECOND PRIZE ESSAY.

IN this number TELEPHONE ENGINEER takes pleasure in presenting the article which won the second prize of twenty-five dollars in the recent contest on telephone etiquette, by Orrin W. Hollis.

The winner of first prize, as printed in our November number, described a remedy for telephone incivility. Mr. Hollis treats the problem from another standpoint, and has prepared an appeal to the user of service rather than to the operating company. So direct is this appeal, in fact, and so clearly does it bring out the points in which the user is at fault, that it is printed without any apology to the operating company for the non-technical nature of the essay nor because it goes over the operator's head to the subscriber. The subscriber, after all, is the root of the trouble; and the company can do no more than direct the campaign of education which is brought to bear upon him. We believe that Mr. Hollis offers an efficient instrument with which to open the campaign.

There may be many ways of saying the things that are said in our second prize-winning article; but we do not believe that any vital points have been omitted, and we do not see how they could have been better said. So all that remains for the operator is to sow this seed in the right place; and that means to distribute it to every telephone subscriber on the books, and in such attractive form as to assure its reading.

After all, if the telephone user can be made to spend some thought upon the subject of telephone etiquette the battle is half won. What is really needed is a certain amount of self-consciousness in telephone conversations. A little introspection by the subscriber, artificially stimulated by the proper literature, ought to work wonders in time.

TELEPHONES OF THE WORLD.

IF any proof is needed of the immense superiority of private enterprise and competition over government control and monopoly as a vehicle for the development of public service, it may readily be found in the remarkable group of statistics which is published in this number by courtesy of our English contemporary, the *National Telephone Journal.*

For nations enjoying the highest degree of civilization in practically every other particular, France, Austria, Hungary, Belgium, Holland and Italy are extraordinarily backward in telephone development. In the first four of these the telephone business is entirely in the hands of the government, while the other two are only partly emancipated. In Austria and Hungary combined there are less telephones than there are in the Chicago system alone. Venerable cities of vast commercial importance and renown—Antwerp, Prague, Lyons, Marseilles, Naples, Milan, Rome, Madrid, Rotterdam, Odessa—cannot compare telephonically with our Peoria, our St. Joseph, our Dayton. Vienna with its two million souls is outstripped in the telephone pace by San Francisco, less than one-fifth its size, to say nothing of Constantinople which has practically no telephones at all. Of the world's estimated ten million telephones the United States has over two-thirds, and the ratio is still increasing.

Commenting on the conditions revealed by the statistics, the engineering supplement of the London *Times* says:

"The reason for this great difference between the development of the telephone in America and Europe is that in America the telephone service has been brought to a high pitch of both technical and commercial efficiency by private enterprise, whereas in Europe it has been practically suppressed by government monopoly. It cannot be seriously argued that the public of most European countries is less desirous of availing itself of rapid means of communication than the American public, or is less generally 'civilized.' The business man, whether he be British, Belgian, Dutch or French, wants to get his business done quickly and economically. The telephone service is the most rapid means of communication there is; it does the work of two telegrams in a sixtieth of the time, and does it better and cheaper. If the Austrian or the Frenchman, comparatively speaking, does not use the telephone, it is not because he does not want to use it, but because his government does not allow

him to do so. His government virtually says to him: 'I arrogate to myself the sole right to supply you with telephone service. It will be inefficient, slow, inaccurate and exasperating; its supply will be surrounded by all the arbitrary and unnecessary regulations which my officials can devise; no improvements will be adopted except under extreme compulsion; additional facilities will be provided so slowly that new customers must be prepared to wait years before securing a telephone, and long-distance calls will take from one to seven hours to complete. But you must take the kind of telephone service I give you, for that is all you will get.'"

It is obvious that this condition cannot last forever. However we, as Americans, may pride ourselves on our national enterprise and aggression, we know that our European brothers are demanding the same conveniences and facilities that we find so essential.

The moral is, plainly, that one day a big field will open to the exploiters of telephonic apparatus. The population of the world, as based upon the Statesman's Year Book and publications of the bureau of the census, is around 1,686,000,000. If the United States, with its 88,000,000, can support 7,000,000 telephones and still demand more, there should be a place for 123,000,000 telephones in the rest of the world. As only some 30,000,000 of these are supplied so far, there would seem to be a potential market for about one hundred million telephones before our present American degree of telephonization is reached. And that figure still leaves a comfortable margin of fifty or sixty millions more before "saturation" is reached—to say nothing, of course, of the increase of population in the meantime. Telephone manufacturers who are complaining that there is nothing more in the telephone business should take heart. There are still some possibilities.

In the meantime let us congratulate ourselves that telephonically we lead the world.

PROBING.

WHEN a school house catches fire and half a dozen children are hurt in the scrimmage to get out of the building; when a coal mine disaster smothers the life out of some of the miners; when a limited train injures its passengers by a leap into a ditch; when one big corporation swallows up another big corporation—look out for the probe.

The probe is modern clap-trap. It follows all progress and all calamity—it never leads. As a make-shift, the old farmers' alliance was better, because the farmers in that organization tried to lead the political procession and failing, they gave up the struggle. They knew when to quit.

The probe is the child of the muckrake. The muckrake had a short life of usefulness, but its progeny has never accomplished anything. The muckrake put men like McCall and Cassatt into premature graves and shook down the high and mighty to the level of the meek and lowly. Its lessons were tragic, but forceful. The great of a few years ago feared the muckrake, but the powerful industrial organizations of today welcome the probe.

A splendid example was offered by the co-operation given the Massachusetts Highway Commission by the New England Telephone & Telegraph Company. This was a probe by act of legislature—an investigation into the rates of the telephone company. The New England company employed scores of assistants to help the commission. It had nothing to cover up, and at the conclusion of the great study, both the commission and the telephone company had some data that might never have been had by any other method. The big organization was benefited by the probe at the expense of the taxpayers. It gave jobs to a lot of people who were prob-

International Independent Telephone Association

THE AUDITORIUM HOTEL, CHICAGO, ILLINOIS

December 7, 8, 9, 1909.

MONDAY, DECEMBER SIXTH.

11:00 a. m.—Meeting of Executive Committee.
2:00 p. m.—Meeting of Advisory Board.
4:00 p. m.—Meeting of Committee on Registration.
5:00 p. m.—Meeting of Sergeant at Arms Committee.

TUESDAY, DECEMBER SEVENTH.

10:00 a. m.—Convention Called to Order.
Invocation.
Address of Welcome, Hon. F. A. Busse, Mayor of Chicago.
Response, Hon. E. B. Fisher, GrandRapids, Mich.
President's Address, E. H. Moulton, Minnesota.
Officers' Reports.
Announcements.
Technical Conference Plans, G. R. Johnston, Columbus, Ohio.
Appointment of Committees.
Adjournment.

AFTERNOON SESSION.

2:00 p. m.—Technical and Practical Conference, Ninth Floor Hall.
Gansey R. Johnston, Columbus, Ohio, in charge.
Discussions after each Paper.
Question Box.

WEDNESDAY, DECEMBER EIGHTH.

10:00 a. m.—State and Provincial Association Reports.
11:00 a. m.—Paper, "Telephone Insurance Exchange," J. B. Hoge, Cleveland, Ohio.
11:30 a. m.—"Continental Telephone and Telegraph Company," John A. Howard, Wheeling, W. Va.
"Proposed Organization," Frank H. Woods, Lincoln, Neb., for Auxiliary Committee.
"A Strong Financial Institution," Hon. E. H. Moulton, Minneapolis, Minn.
Other papers.
Committee Reports and Announcements.

AFTERNOON SESSION.

2:00 p. m.—Technical Conference, Ninth Floor Hall.
Papers and Discussions.

WEDNESDAY EVENING—BANQUET.

7:00 p. m.—Banquet, Auditorium Banquet Hall. Ladies Invited.

THURSDAY, DECEMBER NINTH.

10:00 a. m.—Papers and Discussion.
Report of Committee on Resolutions.
Reports of Special Committees.
Report of Nominating Committee.
Election of Officers.
New and Unfinished Business.
Adjournment.

ably looking for them, but aside from this there were no benefits.

The investigation of a telephone company is, of course, interesting to telephone men, for it shows them what the other fellow is doing, what his plant is worth, and how much money he is making. So perhaps we should admit that much for the probe—it is a good thing in the interest of science.

An unconfirmed rumor prevails that Assistant United States District Attorney Ellis will probe the American Telephone & Telegraph Company, now that it has secured control of the Western Union Telegraph Company. The news was put on the wire at Washington, where they operate incubators for the "jobless." It is very certain that when such a probe gets under full swing, everybody will know about it, for the job will require the services of nearly everybody.

To handle the affairs of A. T. & T. Co., with its very large auxiliary, an organization of a round billion dollars will quite probably be required. A probe will develop some findings that warrant such an immense capitalization. It will also find adequate property to represent the outstanding stocks and bonds. Without any superior knowledge of the affairs of this big corporation, it is assumed that it would welcome some government probing for the benefits of the advertising that would attach to such inquiry.

Another example of legislative probe is being enacted at Buffalo. The Davis committee is investigating the telephone and telegraph companies of New York state. It has developed that the Bell Telephone Company was incorporated in 1879, capitalized at $30,000. In less than three months the capital was doubled and before the year was up the original amount had been increased tenfold. In 1902 authority was received to increase the company's capitalization to $10,000,000. Of this amount $8,122,700 is now outstanding. During the thirty years' life of the company it has paid one hundred and twenty dividends at the rate of 6 per cent per annum or more, besides a stock dividend amounting to a million dollars.

The probe satisfies two crowds—the stockholder of the concern on the grill and the curious outsider. No business can stand more probing than the telephone business.

RATTLING THE SKELETON.

DO YOU remember, a few years ago, when the United States Independent Telephone Company was formed at Rochester with a capitalization of $50,000,000? It was to be the big competitor of the American Telephone & Telegraph Company. Part of the plans included the Stromberg-Carlson Telephone Manufacturing Company to be the rival of Western Electric Company. Nearly everything that had assumed proportions beyond the ordinary in a telephone way was touched upon in the prospectus. Many of the larger operating systems in New York state, including the Stromberg-Carlson factory at Rochester were included. A telephone franchise for New York City was thrown in to make a full measure.

It was the real first thriller that the independents had put together and it proved to be one of the big mistakes that a group of ordinarily sane men will sometimes make. Considerable money was enticed into the U. S. I. from St. Louis, where capital was aroused when it became noised about that a great factory like the Stromberg plant at Rochester would be built there to take care of the western trade.

After a while the bubble burst and a receiver for the U. S. I. did the rest. Among the St. Louis financiers who put money into the venture was one Adolphus Busch. Mr. Busch subscribed for $100,000 worth of bonds and paid into the treasury $80,000 before it occurred to him that a prohibition wave might require a larger sinking fund for his own business.

About the first of last October, Mr. Busch filed his answer to a suit that was brought against him to recover the unpaid twenty thousand. He claimed misrepresentation. Of course there were many other people who lost money in U. S. I., so the Busch case found a lot of sympathizers at Rochester, where the case was being tried. John G. Milburn, attorney for the defense, is one of the foremost corporation lawyers in the country. He was chief counsel for Standard Oil in the case that has only recently been decided which orders that big octopus to dissolve. Judge Alton B. Parker, chief counsel for plaintiff, opposed Mr. Milburn, so you will please observe that there was some "class" to the show.

The litigation is still on and the promise is that it will drag along till Christmas, so it has some proportions as well as some problems. In reality it is the one biggest trial that has ever been thrown around the telephone and it is a genuine pity that our esteemed weekly contemporaries don't know anything about it! It is an intensely interesting trial, too. It has developed some bug-house financiering that would make a peach of a feature story in any of the magazines. As promoters, Finucane and Fenn were almost, if not quite equal to our old college chum, P. Latzke, Esq. The evidence at Rochester discloses that Wm. J. "Fingey" Conners went to bed one night, just as he was wont to do on other nights, and when he woke up the next day he found $2,000,000 worth of nice, new U. S. I. bonds in his clothes. He had a distinct knowledge that he did not buy them.

One telephone man whom we all know and like has assumed the hero role all through the case. That's W. Roy McCanne, secretary-treasurer of the Stromberg-Carlson company. His chief business nowadays is to prepare for a hurry-up call from the court. When he gets it, a big motor whirls him down town and entering the court room, Judge Sutherland, before whom the case is being heard, greets him with a smile and hands him a bouquet and a jolly that he is the one best bet and waves him into the witness chair. McCanne has got so used to this sort of thing that he will be lonesome when the excitement ends.

Some of the evidence that has been drawn out will put a premium on the telephone franchises of all cities. It ought to boost the securities of every telephone company in the world. Witness after witness testified that an effective franchise to operate a competitive plant in New York City would be worth $50,000,000. On this evidence, the capital of the U. S. I. was warranted—except that it only thought that it had a franchise to operate a telephone system in Gotham.

Fortunately, the case has already developed the complete vindication of the U. S. I. directors in their belief that the New York franchise was valid, but as quiet as you may try to keep it, the litigation and the things that it has developed will be bouncing up for years to come, always at the wrong time. Affairs like the U. S. I. work lasting hardship upon an industry that is fraught at best with many complexities that are difficult to explain.

The Principles of Telephone Courtesy

By Orrin W. Hollis

THE TELEPHONE, in its operation, makes no discrimination among persons. It is the agent of all, and the voice of the villain may be transmitted as far as that of the bishop. It will convey abuse as readily as praise. It is the willing and dutiful servant, acting instantaneously at our command. It lies, therefore, solely within the powers of the parties to a telephonic conversation, to make it mutually pleasant or universally disagreeable. If, then, when so conversing, we would strive to forget a few things, the consciousness of which often renders us selfish and overbearing, and would remember certain others, which could not fail to appeal to our finer sensibilities, if properly considered, there would be no telephone discourtesy.

Forget that a mechanical device is the agent of our speech; that distance separates us from our correspondent; that in many instances we may never meet to know each other. Forget all these things and feel, when our party answers, that we have bridged time and space, have penetrated obscurity, and are standing in his very presence.

On the other hand, remember that there are three parties to every telephone connection—all human beings—all possessing kindred feelings and more or less similar failings.

Let us imagine, first, that we are at the sending end of the line, and consider what are our relations with the operator. It is she who brings us within hailing distance of another—who prepares the way over which our voices may travel. We should remember that she is not a machine, not an inanimate object like unto the instrument confronting us, but is, rather, one of a vast army of skilled workers, trained to serve us obediently and without comment.

In further considering this second factor (the operator), we should remember that the great business interest which she represents has placed her at our service because of her proven adaptation. We should not blame her for what goes wrong, unmindful of our own possible failure to make ourselves rightly understood, while in no position to know of the other possible conditions that may have brought about the error. She is not infallible, 'tis true, but she has the skill and experience often born of long association with the elements which go to make up telephone service, and she possesses a forbearance nurtured under the most rigid

"Thank you very much for your favor of October 1 and for the accompanying check for twenty-five dollars, as second prize award in the contest on telephone courtesy.

"From observations extending over a considerable number of years, and rendered the more keen through association with the telephone interests, I am convinced that if we would have courtesy more universally displayed by telephone users, we should pursue a vigorous campaign of education along that line. I am even more convinced of this today than when I wrote the article in question, as I have before me at this moment a clipping from one of the leading dailies of a great city, which reads: 'The reason I can't get good telephone service in ——— is not because the line is busy, but because the operator is busy neglecting business.'

"One would naturally suppose that after more than thirty years' experience with telephone service, people abreast of the times would have outgrown that mistaken and too often expressed idea that the telephone operator answers her calls only when it is convenient for her to lay aside her knitting. And yet we still see such statements in print, with never a hint or suggestion that possibly the patron himself may be responsible for the poor service.

"And so it seemed to me that a journey with the telephone user, over the field in which he plays so important a part, there putting it up to him, as it were, and acquainting him with the requirements placed upon those who wait to do his bidding, would the more quickly and surely secure his enlistment in the cause of courteous service." ORRIN W. HOLLIS.

discipline. We should remember this last fact in particular and. if inclined to strike, refrain from the cowardly practice of striking one who may not strike back.

Too often we are given to blaming "central" for errors of our own committing; carelessness in stating the desired number; omitting to ascertain the correct prefix; a trick of memory, or indistinct speech. The operator cannot read our thoughts. We must not expect her to have any particular knowledge of the fact that Smith's number is so and so and expect her to give us Smith anyway, even though we may have transposed the number. Co-operation is essential all along the line. Good team work alone will bring satisfactory results—and every party to a telephone conversation is an important member of that team, with a duty to perform to the best of his ability.

Beyond the operator, lies the rights of those with whom we desire to converse, or with whom we may accidentally come in contact during the process. Deference to their rights has a claim upon our consideration in no small degree. How and when to approach them, and the manner of dealing with them, are questions of the most vital importance.

We should, in every instance, after "central" has rung the door-bell for us, so to speak, disclose our identity and state the purport of our call in words calculated to impress our correspondent agreeably, while they minimize time. We should never wittingly employ the telephone as a wedge with which to pry open the door to another's sacred precinct, at an unwarranted hour or when our presence, even by telephone, would be an annoyance. Nor yet should we employ it as a means of gaining the ear of one whom to approach otherwise would be presumption, even trespass. We should think twice, and always consider the other fellow's rights and feelings, before taking the short cut into his domains.

Then, too, we should be of whatever assistance possible to the party with whom we may come in contact erroneously. If, when we knocked at a neighbor's door, we were to be confronted by a stranger, would we indignantly say, "I don't want you?" Why, then, say it to the stranger at the telephone, who has afforded us the courtesy of an answer to our call? Or if, perchance, we are called in error, we should give the caller a respectful audience. If a party, in ringing our door-bell, should summon the wrong Mr. Jones, would we think of slamming the door in his face? Are we any more justified in doing such a thing, as it were, to the telephone caller who has mistaken his way?

And this latter condition brings us to the receiving end of the line. Let us now consider our part in the team work there. It is essential always to answer our calls as promptly as possible, never keeping the caller waiting upon our doorstep any longer than avoidable. Respect for our caller demands this, while failure to do so not only may irritate and inconvenience him, but certainly does tie up a vast amount of expensive apparatus unwarrantably, and prevents the prompt passage of other messages, to the discomfort or detriment of someone.

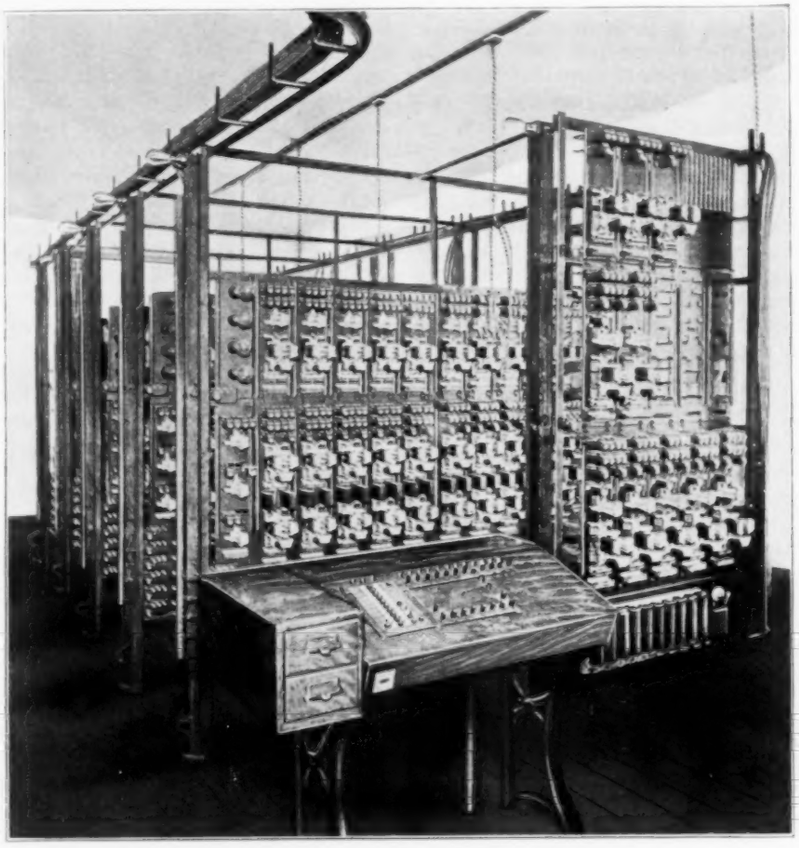
Finally, in a word, let us employ the telephone for such purposes, and conduct ourselves in such a manner when so employing it, as would be acceptable to us from others, and, in so far as we are true to ourselves in these respects, will telephone etiquette be maintained.

The First Automanual Installation

By Henry M. Butterfield

ASHTABULA, OHIO, has the distinction of being served by the first commercial exchange equipment of the Automanual type. Although a number of installations had been previously built and operated under commercial conditions, in order thoroughly to test the apparatus before putting it on the market, these were all operated by the company's experts, and the resulting experience is incorporated in the present installation. The Ashtabula harbor board has now been in operation six months, under conditions as severe as any to be met in telephone practice. The daily tests made and records kept show that previous estimates have been confirmed and even exceeded.

The city of Ashtabula has a population of about 20,000 and is divided into the main town, situated about four miles from the lake, and the Harbor situated at the mouth of the Ashtabula river on the lake. The local population of the Harbor is only 5,000, but conditions there are unusual, mainly due to the fact that it is a very busy port, the largest ore port in the world. It necessarily has extensive railroad terminals, which handle practically all the ore for the Pittsburg district.



Wire Chief's Desk and Automanual Switches.

Prior to the present installation, telephone service had been given by two North Electric manual switchboards, that at the main exchange in the town being common battery multiple with twelve hundred lines installed, and that at the Harbor a magneto transfer board with approximately three hundred and fifty lines. The two boards were connected by open wire leads, ten trunks each way. These leads were destroyed in the sleet storm of March, 1909, and were replaced just prior to the present installation by aerial cable.

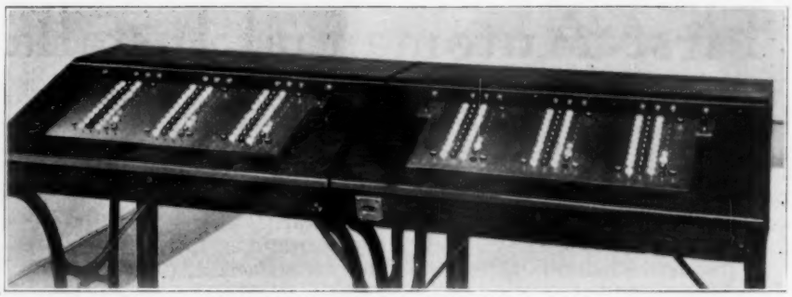
The service at the Harbor required seven operators for a night and day shift, while the main exchange employed thirty to accomplish the same service, making a total for both exchanges of thirty-seven operators. The number of subscribers served at the Harbor exchange prior to the cut over to Automanual was four hundred and twenty-four, and the number at the main exchange is nineteen hundred and sixteen.

It was considered by the company that the conditions thus stated were quite favorable for a thorough demonstration of the possibilities of the Automanual, and it contracted to re-equip both the main and Harbor exchanges, with the idea of starting first at the Harbor with local operators, and after that was successfully working, equipping the main exchange so as to centralize all the operators therein, leaving the Harbor practically an automatic branch. By following this plan, additional economics can be effected, in that the day load at the Harbor will only call for one additional operator at the main exchange, and the night load can be handled by a single operator at Main. A brief statement of the general scheme will make this clear.

The fundamental idea underlying the Automanual system is that of selling skilled and efficient service rather than merely renting apparatus; and the carrying out of this idea results in the elimination of all cords, plugs, ringing and listening keys, line lamps, answering and multiple jacks, together with their mass of complicated wiring; the retention at the subscriber's station of the simplest present known form of equipment, namely a standard common battery telephone; the elimination of transfer operators entirely; the simplification of the answering operator's duties to a point whereby her efficiency is vastly increased and the service correspondingly improved. In the attainment of these objects automatic apparatus is combined with a specialized human intelligence.

Apart from the means by which the operators are used to the greatest advantage, economy is rendered possible by the employment of mechanical switching means. An exchange system can be sub-divided practically without limit into centers and sub-centers, served by distributed automatic equipments working on the principle

of branch exchanges, all controlled from one main operating system or clearing-house. The extent of saving thus effected may be realized when it is recalled that over ninety per cent of the cable and wire plant in local exchange territory is idle all of the time; and by complete sub-division this percentage can be reduced to twenty-five per cent or even less, according to traffic conditions in the territory. In other words, instead of having a single large multiple board serving a large number of lines divided arbitrarily among fixed positions, groups of short lines are carried from the subscribers' stations to local automatic centers, inter-connected by talking trunks only sufficient in number to take care of the maximum load between these centers, all of these branch automatic equipments being controlled by a single centralized group of operators among whom the total load on all the centers can be uniformly distributed at all times, so that fluctuations in any one center or group of subscribers are distributed, and only the total load need be provided for at any given time. All the operators work at maximum efficiency all of the time, and the cable and wire plant at extremely high efficiency during the busy hours.

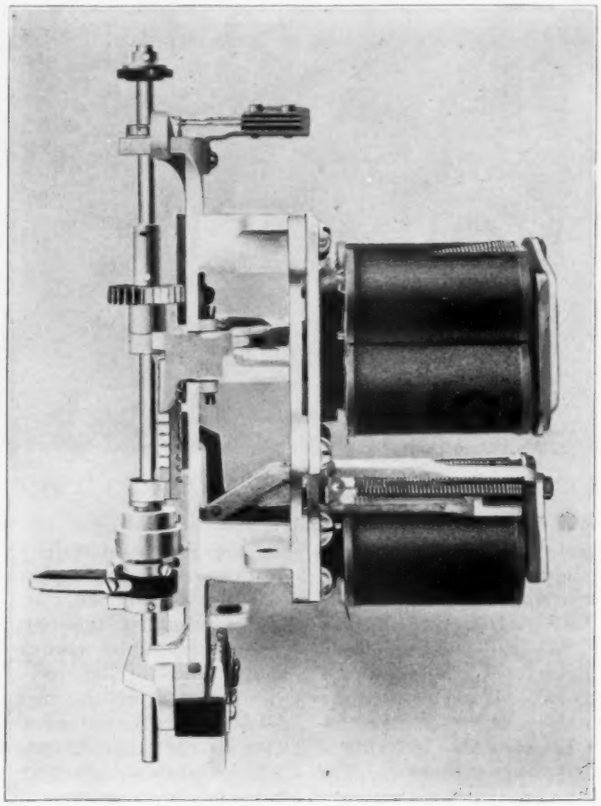


Automanual Board, Two Operators' Positions.

In working out these principles the simplest form of embodiment is in an exchange like at Ashtabula Harbor. Here are installed five units of one hundred lines each, each line adapted for either single or party line service, thus insuring both flexibility and load capacity without the loss of any group of numbers. Each unit is complete in itself, requiring the use of no outside apparatus for the completion of a call, having the line and cut-off relays mounted upon angle plates at the bottom, with the necessary trunk switches and relays above.

The operator's equipment is very simple, somewhat resembling the ordinary school desk. Two positions are provided and each position is equipped with three sets of numbered keys, almost identical in appearance and method of manipulation with those of the ordinary adding machine. Each set of keys has its own lamp signals, a listening button and a starting button. Each complete key set consists of three vertical rows of buttons numbered from 1 to 0, and an additional row of four buttons, which are used for selective ringing. The keys in each strip are mechanically similar to the selective ringing keys in ordinary use, being interlocking, so that when a number is set up all keys previously depressed are automatically released. Connected to these key sets is a power-driven impulse sending machine, from which groups of impulses are taken corresponding to the numbers of the keys depressed. From each key set an operator's trunk is taken to what is called a secondary selector switch, through which it may be connected to a primary selector trunk and calling line.

The subscribers' metallic line circuits come in to the exchange building and after passing through the usual main frame terminals and protectors are ended upon the usual line and cut-off relays, and the local trunks or link circuits between the primary selector and first selector switches are provided with condensers, and sleeve and tip relays on the main battery so that the circuit conditions are identical with those in standard common battery manual boards. All the switches and relays are mounted in the usual manner upon iron racks apart from the operating room.

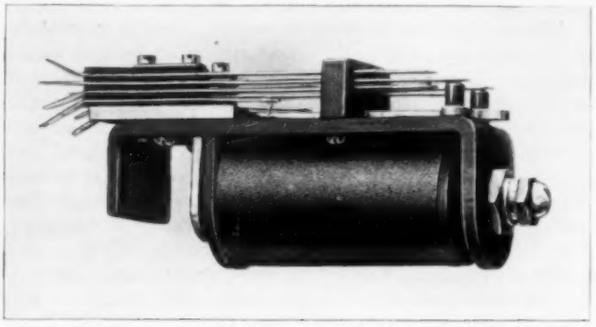


A 100-Point Automanual Switch.

The operation of this equipment is as follows: When a subscriber calls by taking down his receiver, his line relays pulls up and causes a primary selector switch to connect his line with an idle local trunk or link circuit, at the same time starting up a secondary selector switch, which immediately connects the primary trunk and the calling line to an operator's idle key set. The key set lamp then lights indicating a call, the operator comes in on her listening key as usual, gets the number, and depresses the corresponding buttons, thereby determining the number of impulses to be sent to the selector and connector switches to make the desired connection. She repeats this number to the calling subscriber as she sets it up and if correct presses the starting buttons, whereupon her work is done so far as that call is concerned. The sending machine transmits the predetermined impulses to the switches, which then select,

test, and ring the wanted line automatically. As soon as this line is selected, however, the secondary selector or operator's switch is automatically released and restored to normal position, ready for another call.

The subscribers have entire control of their own connection, being in this respect situated precisely as in a full automatic exchange, and they are secure from interruption because it is impossible for any of the operators to cut in or secure access to a line or trunk after a connection is established. To clear-out or make

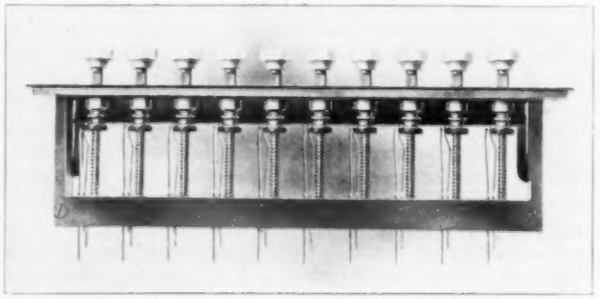


An Automanual Relay.

a re-call the subscribers simply hang up their receivers, when switches are automatically restored.

It will be at once apparent that the location of the operating room adjacent to the switches is a matter of choice and not of necessity, because the only wires having direct access to the operators' keys are their own secondary trunk wires which can be made of any length desired. Thus it is possible to carry these trunks from a common point to more than one switching center, so that the operators can be centralized.

Since the operators' trunks are only in use for each call, during the brief time necessary to answer and send the impulses required to make connection, they are at a maximum efficiency all the time, and the number of trunks required is relatively very small, figuring in large exchanges at less than one per cent. Subscribers' connecting trunks do not necessarily pass to the operating center, but directly between the various switching centers, and are laid out solely with an eye to traffic requirements between the centers and the groups of sub-



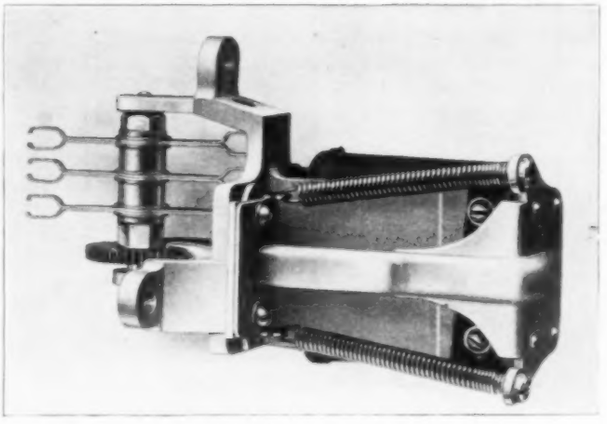
A Distributing Switch.

scribers which they serve. Should the operators for convenience be located at a switching center, however, then of course their secondary trunks would be distributed along with the main connecting trunks, and may be in the same cable. As they constitute in effect automatic order wires, they can be handled in the ordinary way as stated.

With the foregoing arrangement it will now be understood that when the main exchange in the town of Ashtabula is fully equipped, the present operators' positions at the Harbor can be put out of commission, all calls from the Harbor subscribers going to the operators at the Main exchange through their secondary trunks or order wires, and the selective impulses coming back to the Harbor switches by the same route. In any branch as important as this, however, it would be unwise to dispense entirely with local operating means, hence they probably will be kept at the Harbor indefinitely, for use in case of emergency, such as would arise for example through accident to the trunk cable, or a fire in the Main exchange. In a larger system, it would be possible to get the same protection without local operating equipments, by providing auxiliary main centers or operating rooms either for groups or for all of the switching centers.

There are no rural lines terminating at the Harbor and no toll lines, as all service of this character is handled from the Main exchange.

When the cut over is made at the Main, the rural lines will be handled in the same manner as local lines with the added feature of furnishing ten party selective



A Strip of Operating Keys.

service through the use of five frequencies, and ringing to ground through condensers on both sides of the line.

Toll business will be handled as at present through a local toll board.

The wire chief's desk, in addition to the usual testing circuits and instruments, is also equipped with a set of operator's keys.

The power plant consists of a duplicate set of storage batteries of one hundred and twenty ampere hour capacity each, and each set consists of twenty cells, thus making a forty-volt system.

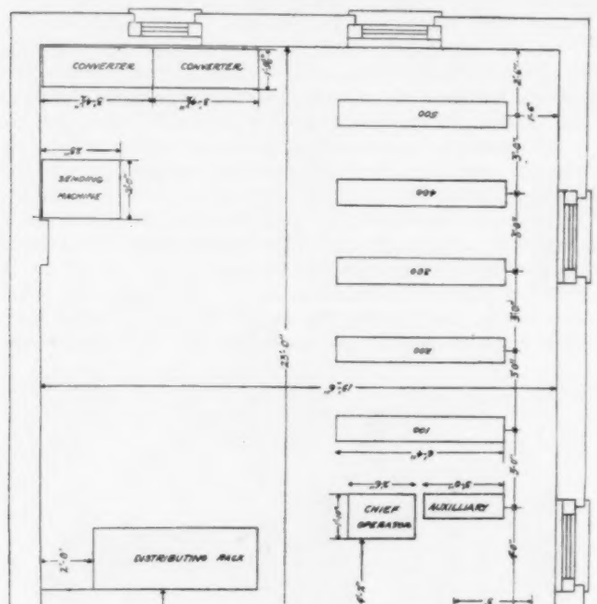
A direct current charging set and power switchboard completes this outfit.

Ringing is accomplished through the medium of a duplicate set of synchromonic converters supplying current at the frequencies of 30, 42, 54 and 66 cycles, and four party selective service is furnished.

Aside from standard equipment incident to all common battery installations such as power plant, protecting and ringing devices, there are but five different pieces of apparatus required to complete an Automanual installation: First, the impulse or sending machine; second,

the operator's keys; third, the Automanual relay; fourth, the one hundred point two-motion switch; fifth, the twenty point one-motion switch.

An examination of the sending machine reveals a simple but well-made device consisting of a drum upon which are placed cams arranged to furnish impulses from one to ten in accordance with the keys depressed by the operator. It is driven by a small motor direct from the storage batteries. This sending machine is common to the entire system and performs for the system the same functions that in a full automatic installation are performed by the dial or sending device, located at each subscriber's telephone. No sending machines are required at branch exchanges but only at the point where operators are located.



First Floor Plan, Ashtabula Automanual Exchange.

The switching racks are of open steel construction and each rack carries the line and cut off relays together with the necessary trunking apparatus for one hundred lines.

All one hundred point switches are alike, all twenty point switches are alike, and all relays are alike mechanically, and all parts of each particular piece of apparatus are made identical in construction and interchangeable. The bank contacts are placed vertically instead of horizontally to prevent dust accumulation and thus they are interchangeable with all other pieces of apparatus of similar character.

The long established and well-known rule of inverse squares enters so strongly into the design of apparatus of this character and the line of demarcation is so distinct as to astonish the designers themselves.

The chief operator has upon her desk the automatic registers which show just what each operator is doing all the time and in addition a waiting call meter which is common to all operators' positions, and which indicates to her automatically and continuously the exact number of calls that are waiting to receive attention.

As an illustration, suppose she is supervising the work of five operators, each operator having three key sets and handling calls at the rate of a call in three seconds and the meter shows five waiting calls she knows that all of these calls will land on idle key sets within three seconds, but if she sees that the load is building up beyond the standard allowed, all she has to do is to put on an additional operator. In the same manner the call meter notifies her when to release operators.

Each unit frame carrying the apparatus for 100 lines is entirely self-contained and its dimensions are as follows: 6 feet 3 inches long; 7 feet 4 inches high and

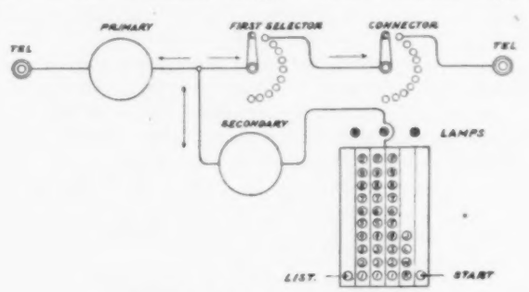


Diagram of an Automanual Call.

8½ inches in thickness, and weighs six hundred pounds, or six pounds per line. They are placed upon three foot centers which allow ample space for even a corpulent individual to work conveniently between units. In cases of limited floor space this could with safety be slightly reduced and in no event would there ever be any occasion for increasing it.

A vertically mounted terminal rack is carried upon each end of the frame, one for the purpose of connecting the cable to the main distributing board, and the other to unite the interconnecting trunks between units.

An examination of the accompanying floor plan of Ashtabula Harbor indicates very interesting economies as regards floor space. The storage batteries are in the basement and the second floor was fitted up for living rooms although at present occupied by a reserve stock of telephones.

The disastrous results of the worst sleet storm known in Ohio in twenty years followed a few weeks later by a cyclone together with the attempt to give service with equipment twelve years old, had thoroughly demoralized the telephone service at Ashtabula Harbor for about two months prior to the cut over to Automanual, and the satisfaction which the new equipment appears to be giving to a community which was rather out of patience with all telephone service is a testimonial which indicates that the system is a success.

The Telephones of the World

By W. H. Gunston*

THE purpose of this article is to show the telephonic development in stations of the principal countries in the world at the latest available date—where possible at January 1, 1909. The telephone systems of Europe are mostly in the hands of the respective governments; but in North and South America they are in the hands of private companies, while in Asia and Africa they are fairly divided between these two forms of administration. In the case of government systems and of large companies like the American Bell and British National Companies, it is generally possible to obtain accurate and reliable figures; but in the case of a country whose telephones are worked by a number of companies of various sizes, some operating in half a kingdom and others in a single town, it is not so easy to get correct and recent information. In all cases the latest reliable figures have been obtained, and where estimates have been resorted to this expedient is plainly indicated.

Telephone development has been so extremely rapid of late years that it is thought that it will be of interest to make some comparisons of the telephone statistics of the two last decades. These figures show more eloquently than words the ten to twenty-fold increase in stations which have taken place in all civilized countries.

A list, as complete as practicable, showing all the cities of the world containing 10,000 telephones will be appended to the series. The respective figures refer in all cases to January 1 in each given year unless some other date is specified.

EUROPE.

Great Britain.—January 1, 1909, there were 565,854 stations of which 475,899 belonged to the National Telephone Company, 83,455 to the Postoffice, and about 6,500 to the three corporation systems of Hull, Portsmouth and Guernsey (estimating the latter on the basis of their figures of March 30, 1908). In 1889 there were about 28,000 telephone lines in the United Kingdom, and at the beginning of 1899, 120,144. To the latter figure should be added perhaps a thousand or two lines belonging to the Postoffice.

The development of the principal towns is as follows:

	1889 (lines).	1899 (lines).	1909 (stations).
London (company and post office)	6,978	20,561	164,208
Glasgow (company and post office)	2,125	6,927	43,928
Liverpool-Birkenhead	1,577	10,413	26,849
Manchester	1,400	5,985	21,209
Birmingham	716	3,559	13,479
Edinburgh-Leith	....	2,772	10,889
Hull (company and corporation)	....	1,437	10,800
Leeds	717	3,624	9,072

The London telephone area to which the above figures refer far exceeds the ordinary geographical boundaries of London, and includes Waltham Cross, Barnet, Hartow, Southall, Kingston, Richmond, Epsom, Croydon, Bromley, Dartford, Grays, Romford and Woodford. Within the London county limits there are not less than 154,000 telephone stations, or one to about every 30 inhabitants.

Germany.—The telephone here is in the hands of the imperial postoffice (which has jurisdiction over Saxony, Baden and the smaller states, as well as over Prussia) and the Bavarian and Wurtemberg governments. The present number of telephones, January 1, 1909, is 851,319. In 1899 it was 213,032, and in 1889 might be computed at 39,700. Principal towns:

	1889.	1900.	1909
Berlin	11,000	42,438	102,965
Hamburg	4,800	16,837	41,809
Munich	....	....	22,160
Frankfurt	....	7,015	19,230
Leipzig	....	6,885	18,556
Dresden	....	7,649	16,623
Cologne	....	6,047	15,686
Charlottenburg	....	....	15,060
Stuttgart	....	....	13,750
Breslau	....	....	12,619
Düsseldorf	....	....	10,841
Nuremberg	....	....	10,653
Hanover	....	....	9,871

In Greater Berlin, which includes Charlottenburg, Rixdorf, Wilmersdorf, Lichtenberg and Schöneberg and over 3,000,000 inhabitants, there are 139,622 stations.

In 1889 Germany was easily ahead of the rest of the world in the telephonic development of its large cities, numerically at least. At present, although far surpassed by America, it possesses the greatest number of telephones of any state in Europe, and the proportion of telephones to population is about the same as in Great Britain. In the latter country it is about one telephone to every 78 inhabitants, and in Germany one to every 72.

France.—Government system. The total stations now amount to 194,159. In 1899 they were 53,449, and in 1889 9,500. The principal cities are Paris with 65,033 telephones (in 1899 there were 5,300 and in 1904 46,933); Marseilles, 5,572; Lyons, 4,910; and Bordeaux, 3,877.

Netherlands.—The Amsterdam, Rotterdam and Hague telephone services are in the hands of the respective municipalities. The other towns are operated by the government, by the Netherlands Bell Company and other private companies. At the beginning of 1908 there were 43,449 stations in Holland; ten years ago there were 12,345.

The stations in the principal towns at January 1, 1909, were as follows: Amsterdam, 10,660; Rotterdam, 8,176; the Hague, 5,810.

Belgium.—The telephone service is in the hands of the state, and at January 1, 1909, comprised 38,503 stations. In 1899 there were 14,247. At the beginning of the current year there were 13,348 telephones in Brussels, 5,496 in Antwerp, 3,685 in Liege, and 2,018 in Ghent.

Sweden.—In Sweden at the beginning of 1908 there were 150,948 stations, of which two-thirds were operated by the state and one-third by the Allmänna and Bell Telephone Companies. The telephonic development of Sweden has always been high. In 1889 there were 13,000 subscribers, and in 1899 63,645. In Stockholm with 337,000 inhabitants, the Allmänna and Bell Companies possessed at the beginning of 1909 50,988 telephone stations, and as in the same city the state system had 17,817 stations at the beginning of 1908, the total stations in Stockholm can not be less than 70,000. At January 1, 1908, there were 10,547 telephones in Gothenburg and 5,436 in Malmö.

*Reprinted from the *National Telephone Journal*, London, England.

Norway.—There were 49,398 telephones in Norway at the beginning of last year, 14,498 being in Christiania. There are now 15,198 in the capital. Ten years ago there were about 26,000 stations in Norway, and in 1889 about 3,930.

Denmark.—Denmark contained 60,825 telephones at the beginning of last year. In 1899 there were 21,825. January 1, 1909, there were 37,723 stations in Copenhagen and the suburbs. Copenhagen is operated by the Kjöbenhavns Telefon Aktieselskab, which in the whole of Seeland has 47,553 stations; in 1886 it possessed 1,172 subscribers; in 1896 6,469 stations, and in 1901 18,929 stations. Funen is worked by the Funen Communal Company, and Jutland by the Jutland and South Jutland Companies. In both Aarhus and Aalborg there are about 3,000 telephones.

Austria-Hungary.—There were 124,325 stations in the empire at January 1 last, to which another 500 may be added for Bosnia and Herzegovina.

In Austria there were (January 1, 1909,) 80,975 telephones under the state administration; at the beginning of 1899 there were 27,303. In 1889, when the telephones were in the hands of the Telephone Company of Austria, an English concern, there were 4,500. The following are the particulars relating to the principal towns:

	1889.	1899.*	1909.
Vienna	1,600	12,500	35,011
Prague	610	2,300	5,564
Trieste	....	1,100	2,870

In Hungary, where the telephone is also under state ownership, the present number of telephones is 43,350. In 1899 it was 12,869. The number of stations in Budapest at the beginning of the current year was 13,906, in Fiume 1,262 and in Zagrab 1,161.

Switzerland.—State ownership. The present number of subscribers' stations is 69,122. In 1899 it was 35,824 and in 1888, 7,626. The principal urban systems are Zürich 9,576 telephones, Geneva 6,384, Basle 5,676 and Berne 3,743. In 1897 there were 4,400 subscribers' lines in Zürich, 3,264 Geneva and 2,025 in Berne.

Italy.—The state has lately acquired the systems of the Società Generale and the Società per l'Alta Italia. The number of stations January 1, 1909, was 53,721, of which 9,179 were in Milan, 8,015 in Rome, 4,518 in Genoa, 3,687 in Turin, 2,585 in Florence and 2,578 in Naples. In 1900 there were 13,859 telephones in Italy and in 1889, 9,183.

Russia.—The telephone at St. Petersburg is in the hands of the municipality; at Moscow and Warsaw in the hands of Swedish companies; and elsewhere it is operated in some cases by the state and in some cases by concessionaires.

The number of telephone stations in the Russian empire at the beginning of 1908 was 97,643, of which 19,394 were in Moscow, 16,410 in St. Petersburg, 12,503 in Warsaw, 4,737 in Riga, and 3,181 in Odessa. Ten years ago there were 23,841 telephones in Russia, and in 1889, 7,585.

Spain.—The number of telephones in 1908 was 18,545, of which 2,975 were in Madrid and 3,549 in Barcelona. At the beginning of 1899 there were 11,685, and in 1902, 12,819, of which 967 were in Madrid and 2,752 in Barcelona. The exchange systems are almost entirely in the hands of various concessionaires, and the trunk line system is owned by the Northeastern Interurban Company. The state has less than 1,000 subscribers.

*Estimated.

Portugal.—The telephone in Portugal is practically entirely in the hands of the Anglo-Portuguese Telephone Company, which has 3,401 subscribers at Lisbon and 1,539 in Oporto. The total number of stations in the country is about 5,000.

Roumania.—State administration. At March 31, 1907, there were 9,157 stations in the country; it may be estimated that there are at present about 11,500. Ten years ago (1899) there were only 2,951 stations.

Servia.—The number of telephones (which are worked by the state) in this country at the beginning of 1907 was 1,382. It is now 2,057.

Bulgaria.—State owned. The number of telephone stations at the beginning of this year was 2,039, of which 959 were in Sofia. Ten years ago there were only 362.

Greece.—State ownership. The total number of stations at the beginning of 1908 was 1,365. It may now be computed at 1,500 at least. In 1899 there was but 146 stations.

Turkey.—Before the establishment of the constitution the importation of telephones into this country was prohibited. The government now has under consideration the laying down of an exchange telephone system. In the meantime, a small private governmental exchange with about seventeen stations is working.

Luxemburg.—Ten years ago there were 1,721 telephone stations in this grand duchy, which has a small population and no large towns. At the beginning of 1907 there were 2,809, and by now there are probably upwards of 3,000.

Iceland.—This remote island, so interesting to Englishmen as preserving the ancient language of the Norsemen and Danes, appeared in telephone statistics of the Bureau International last year for the first time. At the beginning of 1907 there were eleven exchanges and 359 telephones.

SUMMARY OF EUROPE.

	Jan. 1, 1908	Jan. 1, 1909.	Population per telephone.
German Empire	768,266	851,319	71
Great Britain and Ireland	528,763	565,854	77
France	178,518	194,159	202
Sweden	150,948	156,000*	34
Austria-Hungary	108,457	124,825	209
Russia	97,643	113,000*	1,322†
Switzerland	64,953	69,122	44
Denmark	60,825	67,339	38
Norway	49,398	53,726	43
Italy	44,834	53,721	625
Holland	43,449	48,134	117
Belgium	34,818	38,503	188
Spain	18,545	19,500*	955
Roumania	.....	11,500*	573
Portugal	.....	5,000	82
Luxemburg	.....	3,000*	82
Bulgaria	.....	2,039	1,970
Servia	.....	2,057	1,306
Greece	.....	1,500*	1,733
Iceland	.....	500*	152
Total	.....	2,380,798	168

ASIA.

The telephonic development of Asia presents nothing remarkable. At present, with the exception of Japan (which contains three-quarters of the telephones in Asia),

*In countries marked thus the number of telephones at the beginning of 1909 has been estimated from the rate of progress in recent years.

†It should be remarked that the figures for Russia include those for Siberia and Central Asia. The development of Russia in Europe would therefore be rather higher than indicated by the figures shown.

it is confined to those countries where Europeans have settled or rule. These remarks may not hold good for many years more, as China, Persia and other native states are commencing the establishment of telephone systems. It has not been thought necessary to show the proportion of telephones to population as in the case of Europe, as the few thousand stations which serve the hundreds of millions in China, India and Japan would yield a figure of little significance.

India.—The Oriental, the Bengal, and the Bombay Telephone Companies had at the beginning of 1909, 4,630 connections in Bombay, Ahmedabad, Karachi, Calcutta, Madras, Rangoon and Moulmein. The Telegraph Department of the Indian government maintains 3,573 stations, but it is to be observed that the government telephones, with few exceptions, are not available to the public for the transmission of paid message traffic. There are thus altogether 8,203 stations in India. Ten years ago there were 2,889.

In Ceylon (state system) there were 641 stations at the beginning of 1909, of which 615 were in Colombo.

In Singapore (Straits Settlements), there were 1,005 telephones in the Oriental Company's system January 1 last.

Dutch East Indies.—The telephone here is partly in the hands of the state, and partly in the hands of eighteen private companies. At the beginning of 1908 the former had 3,905 stations, and the latter 2,513. There are probably now 7,000 telephones in these colonies. Ten years ago there were 4,833.

Cochin China, Cambodia (French Indo-China).—At the beginning of 1898 there were 235 stations here, and in 1908, 681.

China.—The Chinese government has recently let a contract to the Western Electric Company for equipment for the establishment of a telephone service in Pekin. The Shanghai Mutual Company has a number of stations working approximating 5,000.

The China and Japan Telephone Company possess 925 telephone stations in Hong Kong and Kowloon.

Japan (State ownership).—The recent extension of telephony in Japan has been somewhat rapid. At the beginning of 1908 there were 52,153 telephones in operation, and in 1909 71,430, while 46,678 more were in course of construction. The following are the principal systems:

	In operation.	In construction.
Tokio	18,589	10,406
Osaka	7,576	8,080

In addition the state systems in Formosa in 1898 served 1,767 stations, in Japanese Sakhalin 150, and in Corea 3,350. Ten years ago there were only 8,177 stations in Japan.

Russia in Asia.—Exchanges exist in Siberia, in Central Asia and south of the Caucasus, but the number of stations are included in the grand total for the Russian Empire and shown under Europe. Tiflis, Irkutsk and Baku have each over 1,000 stations.

Persia.—The telephone has been established on a small scale in Teheran, but recent political troubles and the agitated state of the country are hardly likely to facilitate its development at the present.

Afghanistan.—A line from Jellahad to Herat is almost completed, but no information is to hand as to the number of stations—probably very small—in operation.

SUMMARY OF ASIA.

	Jan., 1908.	Jan., 1909.
India	7,477	8,203
Ceylon	518	641
Singapore	....	1,005
Dutch East Indies	6,418	7,000*
French Indo-China	681	710*
Japan	52,153	71,430
Formosa, Japanese Saghalin	1,910	2,400*
Corea	3,350	4,000*
China (Shanghai and Hong Kong)	....	5,000*
Russia in Asia (included under Europe)	....	....
Total	....	100,389

AFRICA.

The telephonic development of this continent is, as might be expected, and as in the case of Asia, almost entirely confined to European colonies or European-ruled countries.

Egypt.—The Telephone Company of Egypt has exchanges in Alexandria, Assiout, Cairo, Port Said, Mansourah, Zagazig, Tantah, Suez and Fayoum, with 7,025 stations in all at the present time.

Algeria.—The French government administers the telephone service in this country, which at the beginning of the year comprised 4,261 stations, of which 1,370 were in the town of Algiers and 624 in Oran.

Tunis.—At the beginning of 1908 the French government had 1,144 telephones working in this country. Ten years ago there were only 216, and there are now probably 1,300.

Ethiopia (Abyssinia).—This native state has a regular system of government trunk lines, but the telephone stations consist chiefly of call offices at the principal towns and railway stations.

Portuguese Africa, Madagascar and *Senegal.*—These states only muster a few hundred subscribers' stations between them, not more than 500.

Cape Colony.—The number of government telephone stations in the colony at the beginning of this year was 4,560, of which 2,289 were in Cape Town and district. In 1902 there were only 1,577 stations.

Transvaal.—The total number of telephones worked by the Transvaal postoffice was 4,344 on January 1 last. Of these 3,009 were in Johannesburg and 688 in Pretoria.

Orange River Colony.—The postoffice has 532 telephones working, of which 160 are in Bloemfontein.

Natal.—At the beginning of 1908 there were 2,246 stations in Natal, 1,164 belonging to the government, and 1,082 to a municipality. The total may be now computed at 2,300. Ten years ago there were under 300.

SUMMARY OF AFRICA.

	Stations, 1909.
Egypt	7,025
Algeria	4,261
Tunis	1,300*
Cape Colony	4,560
Transvaal	4,344
Orange River Colony	532
Natal	2,300*
Total (with allowance for Ethiopia, Senegal, Madagascar, Rhodesia and German and Portuguese Colonies	25,000

(To be continued.)

*Estimated.

How to Read Telephone Circuit Diagrams

By David S. Hulfish

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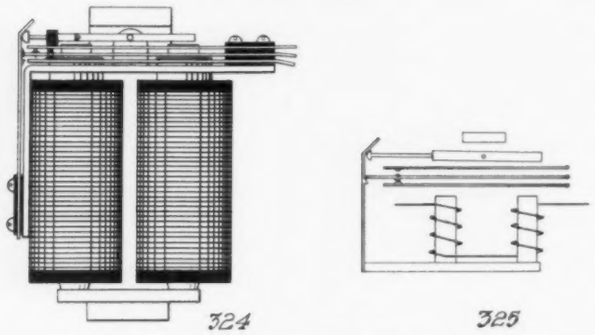
LESSON XI.

IT is required sometimes of a piece of apparatus that it perform its operating functions upon the cessation of the energizing current, rather than upon the beginning of the current. An instance which may be cited in particular is the release magnet upon an automatic switch, which usually releases or restores its switch upon the cessation of the current which has energized the release magnet. Similar duty sometimes is required of a relay. A locking relay of such a nature is presented in mechanical detail in Fig. 324 and a symbol which has been used to represent it is presented in Fig. 325. In

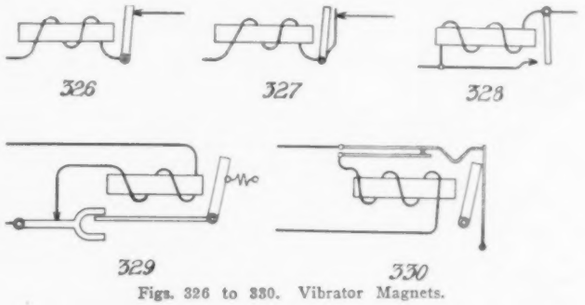


Figs. 325 and 325. Reverse-Acting Relay and Its Symbol.

Fig. 324, the vertical spring at the left is merely a locking spring. It is provided with two teeth for locking purposes, and with an inclined surface to receive the thrust for unlocking the relay contacts. The electrical switch is of three springs, and the black insulating strut between the two outer springs, appearing near the left end, spaces the outer spring apart without interfering with the middle or long spring. The armature is pivoted in the middle and carries an insulating block for depressing the switch springs, and a projecting stud, probably insulated also, for pressing the locking spring outward. The armature may be tipped in either direction, according to the direction of the current through the coils of the relay. Normally, the long spring is in contact with the upper spring. When the left end of the armature is drawn downward by the magnets, the insulating block of the armature pushes down both the upper and lower springs, until the long spring is caught between the teeth of the locking spring, the long spring meanwhile, by its own spring tension, keeping contact with the upper spring, and continuing so in the depressed position of all three springs as long as the operating current continues to flow through the coils. When the energizing current ceases, the armature is released and the top and bottom springs are released, moving upward by their own spring tension, but the long spring is detained by the locking spring. Thus the upper spring moves away from the long spring and the under spring moves upward into contact with the long spring, and the condition of the switch is changed, the change being effected upon the release of the armature, rather than upon its primary actuation. The switch is restored by operating the armature in the other direction, by passing current of the opposite polarity through its coils. The rising of the left end of the armature presses the stud against the inclined face of the locking spring, pressing the locking spring away from the long spring of the switch and releasing the switch upon the beginning of the release-current impulse. In the symbol, Fig. 325, the small rectangle above the pivot of the armature represents the end of the polarizing permanent magnet.

Vibrator magnets form the subjects of the symbols of Figs. 326 to 330. Fig. 326 shows a device whose helix is wired through its own back contact. When a constant potential is applied to this divice, the core is energized, attracting the armature and breaking the energizing circuit; the core, thereby, is deenergized, releasing the armature and again closing the energizing circuit, completing the cycle, which is repeated continuously so long as the potential is applied. Such a device is the battery buzzer, and the symbol of Fig. 326 is used as a symbol for a buzzer. With a tapper upon the armature and a gong adjacent, it becomes the symbol for a battery vibrating bell. In the symbol of Fig. 327, a yielding spring is attached to the armature to continue the electrical contact during a longer period and thus reduce the rapidity of vibration of the armature. Fig. 328 shows a closed-circuit vibrator, since it does not open its helix circuit, shunting its helix instead by its own contact to release its own armature.

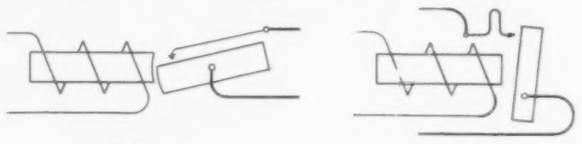
Two vibrator magnets which are specialized to secure a long swing to their armatures are shown in Figs. 329 and 330. In Fig. 329, the *Y*-shape lever is assumed to remain inert in either position where it may be left by the tongue, which is attached to the armature and which projects its free end between the branches of the *Y*.



Figs. 326 to 330. Vibrator Magnets.

With a potential upon the leading-in wires of the helix circuit of the vibrator, the core is energized, and after the armature has moved through its full swing toward the core, the tongue attached to the armature engages the lower branch of the *Y* and opens the contact of the helix circuit. This deenergizes the core and releases the armature, but the core is not energized again until after the armature has completed its full return swing and the tongue again engages the *Y* at its upper branch, and again moves it to close the helix circuit, completing the cycle, which is thereafter repeated indefinitely.

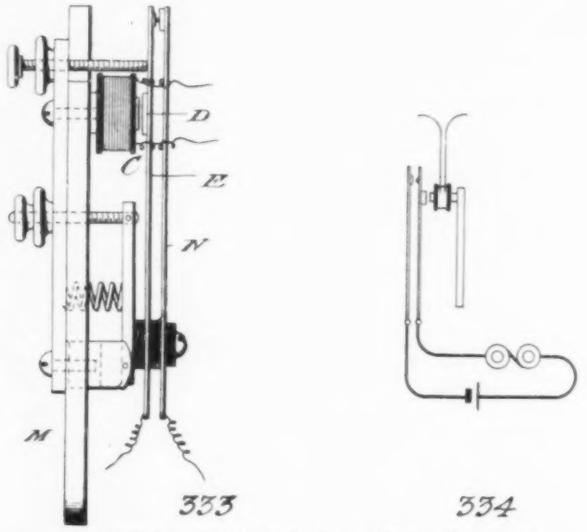
In Fig. 330, the armature, when attracted, pushes up the upper spring of the switch; the vertical locking spring at the right then drops under the upper switch spring and holds the switch open. The armature now must accomplish the full return swing to knock the locking member from under the switch spring before the helix circuit can be closed again. The period of vibration of such a cyclic relay may be made as slow as desired by the provision of a suitable sluggish armature.



Figs. 331 and 332. Relays for Alternating Current.

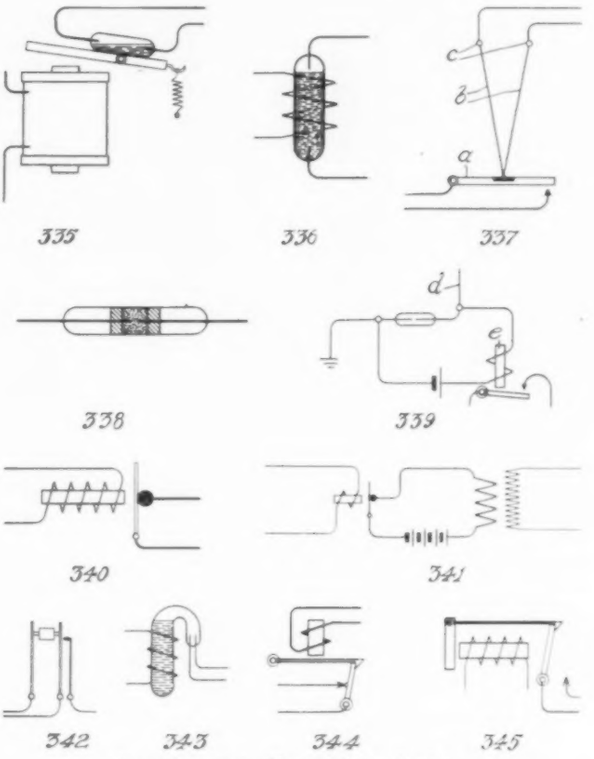
Cyclic, or vibrating devices, may have mechanical members directly operated by the armature, as, for instance, the armature in Fig. 266 may be a vibrating armature to drive the ratchet in successive steps. Another method of use involves the connection of some electromagnetic device in series with the vibrator contact, such as the device of Fig. 266, whereby the vibrator acts only as a means for deriving a pulsating current from a constant potential, resulting in the intermittent operation of the controlled device.

Alternating current relays, or relays designed to respond to alternating currents, are shown in Figs. 331 to 339. The distinction which classes an alternating current relay as such, and discriminates between an alternating current relay and a direct current relay is the function of closing the controlled circuit continuously in response to an alternating current passing through the relay helix. It is obvious that a sensitive neutral relay, with quickly acting armature, will respond to every pulsation or alternation of a current of sufficient strength, but that its armature circuit will be opened for a brief time between the successive alternations. In short, an ordinary relay with quickly acting armature will vibrate its armature in response to an alternating current through its helix. A polarized relay of ordinary construction would not respond to the current waves in one direction, but would respond to the waves in the other direction, thus vibrating its armature at only one-half the speed, or one vibration per cycle instead of one per alteration.



Figs. 333 to 334. Relay for Small Circuits and Its Symbol.

A relay having a sluggish armature will attract its armature in response to alternating current of sufficient strength, and the armature, because of its sluggish movements, will not fall back between impulses sufficiently to permit its controlled circuit to break. This armature will vibrate for every pulsation under the varying degree of magnetization of the relay core, and a yielding contact member, therefore, it is required to retain the closed circuit during the vibration of the armature. The symbols of Figs. 301 to 304 are suitable for alternating current relays, particularly if combined with a yielding front contact such as is indicated in the symbol of Fig. 309.



Figs. 335 to 345. Unusual Relay Symbols.

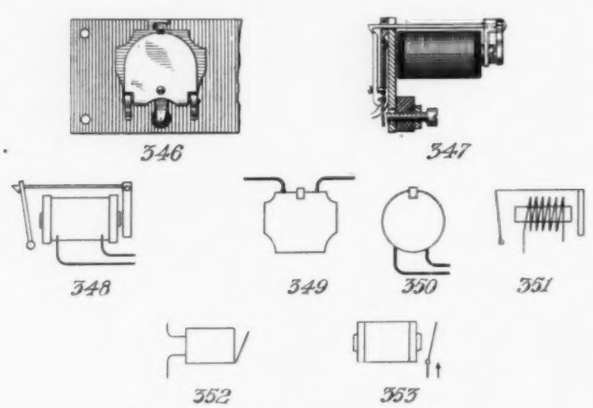
The symbol used most frequently is that of Fig. 304, sometimes modified to show the yielding contact. Figs. 331 and 332 may be taken as types of symbol for the heavy, sluggish armature type of alternating current relay.

Because of the weight of the armature involved, such relays as may be represented mechanically by the symbols of Figs. 331 and 332 usually are not sensitive to weak currents, nor to very rapidly alternating currents. The relay shown in some mechanical detail in Fig. 333 and in symbol in Fig. 334 is designed for operation in response to very small and very rapid currents. In this relay, the permanent magnet *M*, of horseshoe form, carries the pair of electromagnets *C*. The armature *D* is attached to the spring *E*, which is adapted to make contact electrically with the companion spring *N*. Various adjustments are provided. In the symbol, Fig. 334, the armature contact of this relay is shown connected

in series with a battery and an auxiliary pair of electromagnets. When a rapidly alternating current is passed through the helix *C*, the contact of the alternating current relay is kept closed for a sufficient proportion of the time (even if not continuously) to secure a continuous attraction of the armature controlled by the auxiliary electro-magnets.

All of the relays thus far discussed have been shown in detail and in symbol as electromagnetic devices controlling their contacts by the operation of a movable armature, the armature either being itself a part of the controlled circuit, or acting to control in turn electrical springs included in the controlled circuit. Figs. 335 to 343 show a few selected symbols typifying relays which involve other methods of controlling the local circuit.

Fig. 335 shows a symbol for a relay in which the contacts are adapted to be closed by a body of mercury which by the inclination of the armature becomes so placed in a sealed glass tube, or cell, that the circuit is opened or closed, as required. With the cell tipped in one direction, the mercury touches both of the wires whose ends are sealed into the walls of the cell, thus completing an electrical path between them. With the cell tipped in



Figs. 346 to 353. Annunciator Drops.

the other direction, as in the position shown in the symbol, the mercury runs away from one of the wire ends, and the path between them is broken. The mercury cell is found in many combinations in symbols.

Figs. 336 and 337 show thermal relays. In the symbol of Fig. 336, a sealed mercury cell is represented together with a coil for heating the mercury. By heat from the operating helix, the mercury expands, rises in the cell, and touches the upper wire end. In Fig. 337, the terminals *C* are fixed, and the arm (or armature) *a* is held away from its contact by the wires *b*, which are attached, at one end, to the armature, and, at the other, to the fixed points *c*. When current is passed through the leading-in wires at the top of the symbol, thereby passing through the wires *b*, which form the actuating, or controlling element of the device, the wires *b* become heated and expand in length. The expansion of the wires *b* permits the arm to be lowered to touch its contact point, closing the local circuit of the device.

Fig. 338 shows the usual symbol for a coherer. This device consists usually of a glass tube containing two wire ends slightly separated, the chamber in which the separated ends are held being filled with fine metal granules. The coherer normally has a high resistance, but when a small current passes through it, the resistance is very greatly decreased, due to the tendency of the metal granules to crowd closely together, or to "cohere." An agitator is required in practice to shake the granules apart after the cohering, or controlling, current has ceased, but this detail seldom is shown in the symbol. Fig. 339 shows the coherer connected for receipt of messages by wireless telegraphy. The aerial wire *d* is connected through the

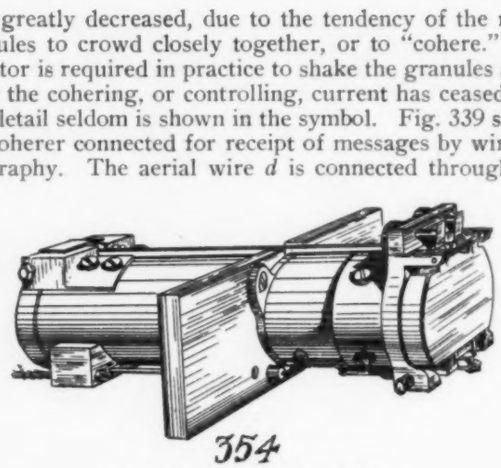
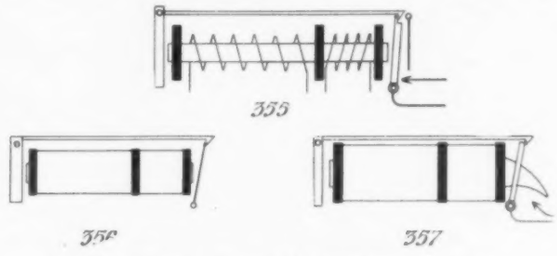


Fig. 354. Self-Restoring Drop.

coherer to earth. The coherer also carries a small current from battery in series with the relay *e*. Because of the high resistance of the coherer, the relay *e* is not energized, but when any current flows from the aerial wire *d* to earth, the resistance of the coherer is decreased, and the current from the battery becomes of sufficient strength to operate the relay *e*. Upon cessation of current from *d*, the coherer returns to a high resistance, and the armature of the relay *e* accordingly is released.

Telephone relays, or speech current relays, are shown in Figs. 340 and 341. Fig. 340 shows the symbol almost universally used for this device, it being borne in mind that almost any form of electromagnet may be placed as the left-hand element of this symbol, and almost any transmitter symbol may be placed as the right-hand element. The vertical element of the symbol is a single diaphragm which is at the same time, a diaphragm for the receiving electromagnet and a diaphragm for the variable resistance, or transmitter button, of the device. In Fig. 341 are shown simple circuits for this device. Weak currents received from the wires entering the diagram at the left pass through the helix of the receiver electromagnet and move the diaphragm. The diaphragm, thus moved, varies the resistance of the carbon button adjacent to it, thus permitting a varying current of considerable strength to flow through the pri-

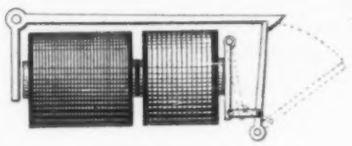


Figs. 355 to 357. Symbols for Self-Restoring Drops.

mary of the induction coil. Induced by the heavy primary currents, there flows from the secondary of the induction coil a current, which, if the parts are properly proportioned and adjusted, is of much greater strength than the current originally received.

Circuit controlling devices which may be energized to change a local circuit, but which may not be actuated thereafter to restore the local circuit, are, in substance, in

the nature of locking relays. Fig. 342 shows a heat coil device in which the two main springs are held together by a heating element, which also connects them electrically. Current through the two wires leading into the symbol at the left, if of sufficient strength, will so heat the bridging element as to cause it to release the springs from each other, whereupon the circuit between the two springs is broken, and the right-hand main spring moves into contact with the contact spring near it. In Fig. 343, the helix, with sufficient current, will heat the mercury in the bent glass tube until there flows over the bend of the tube a sufficient quantity of mercury to connect elec-

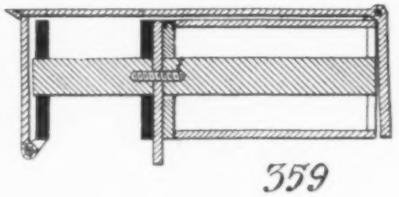


358

Fig. 358. Another Type of Self-Restoring Drop.

trically the two wire ends which are sealed into the shorter end of the tube. In Fig. 344, the energization of the electromagnet will withdraw the latch which forms its armature, thereby permitting the vertical lever to fall and to break permanently the electrical circuit of the contact. In Fig. 345, the energization of the electromagnet will release the drop shutter, and by falling upon the contact point, the shutter will close permanently the circuit of the contact. In each of these tripping relays, the actuating current is unable to reset the device, and the device must be otherwise restored, presumably by the hand of an operator.

Considered with reference to its operation by alternating currents, the device of Fig. 335, if sufficiently



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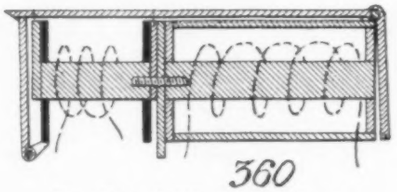


360

Figs. 359 and 360. Locking Drops.

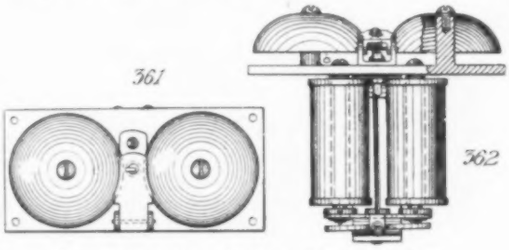
closely adjusted, may retain its local contact closed so long as the mercury is agitated. The device of Fig. 336 may be heated as efficiently by alternating as by direct current; this is true also of the device of Fig. 337. The coherer of Figs. 338 and 339 operates in response to rapidly alternating currents, and closes the local circuit continuously while such rapid currents are flowing from the aerial wire. The devices of Figs. 342 to 345 also will operate for alternating currents in the same manner as for direct currents.

The voice-current relay of Fig. 340 produces an alternating current in its local circuit in response to an alternating current in its controlling helix. By this function, it does not fall within the definition of alternating-current relay as above given, although on final analysis, it is the only device of this group of symbols which truly relays an alternating current.

LESSON XII.

The signal used upon the switchboard, and by which the subscriber signals to the operator that attention is desired, is a visual device usually quite silent in its operation. The earliest type was the annunciator drop, a simple shutter held up by an electromagnetic latch. When the latch was operated the shutter was released and attracted attention by the change in its position. It was necessary to reset the device by the hand of the operator. An improvement was made in drops which might be reset electromagnetically, and in mechanical signals which might be displayed so long as the electromagnet remained energized, and which would reset automatically when the energization ceased. The latest type to come into general use is the incandescent lamp.

Figs. 346 and 347 show in mechanical detail front and side view respectively of a switchboard drop of simple type. Figs. 348 to 353 inclusive show symbols



Figs. 361 and 362. Combined Ringer and Drop.

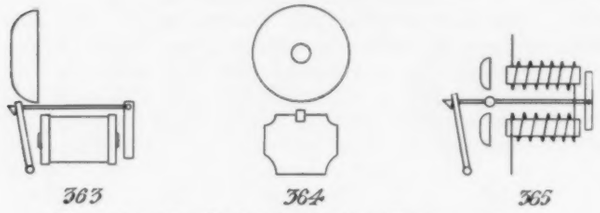
used for switchboard drops. Fig. 348 is a full diagrammatic drawing of the essential elements of the drop, as viewed in Fig. 347. This is the symbol usually met. Fig. 351 shows the elements of Fig. 348 more simply drawn, and the symbol of Fig. 352 reduces the side view of the drop to its ultimate simplicity, omitting the armature and reed or latch tongue. Fig. 353 shows a symbol in which the alarm contact is shown.

Figs. 349 and 350 show symbols in which the face view of the drop is taken. The conductors may enter these symbols at any point.

A perspective view of a so-scalled self-restoring drop is shown in Fig. 354. Such a drop is provided with two independent electric circuits, and usually with two independent electromagnetic systems. One circuit is effective in operating the magnetic latch to trip or release the shutter for display, and the other controls devices adapted to restore the shutter or to return it to its normal position of rest in readiness for a subsequent operation. In the illustration, Fig. 354, a central plate divides the two magnetic systems of the drop and forms the mounting plate for the drop. At the extreme front of the device is a light, thin shutter, hinged at its top edge. Just behind it is a heavy magnetic armature, hinged at its lower edge. This heavy armature by a small movement can push the light shutter through a large angle for display. The heavy armature of the front end is held by the hook end of a reed attached to a heavy armature upon the back end of the device. When the rear magnet is energized, the rear armature is attracted, lifting the reed and releasing the front armature, which by a slight move-

ment sets the light shutter to display. By energization of the front magnet, the front armature is attracted, restoring the light shutter, regardless of the energized condition of the back magnet.

Figs. 355 to 357 inclusive show symbols for self-restoring drops. Fig. 355 shows a symbol which may be considered as taken from the drop shown in Fig. 354. The detail of latch and armatures, the large actuating coil, the small restoring coil, the detail of shutter and



Figs. 363 to 365. Symbols for Combined Ringers and Drops.

the alarm contact are shown. In Fig. 356 the symbol shown is simpler, but may represent the same device. Fig. 357 shows a symbol for a restoring drop of a slightly different mechanical detail, the shutter being magnetic and the restoring coil being provided with an extension polepiece for attracting the shutter through a wide angle. Any drop symbol having two coils may be found to represent a self-restoring drop if the circuit conditions so require.

Mechanical detail of another type of self-restoring drop is shown in Fig. 358. The operation is simple and the illustration seems self-explanatory.

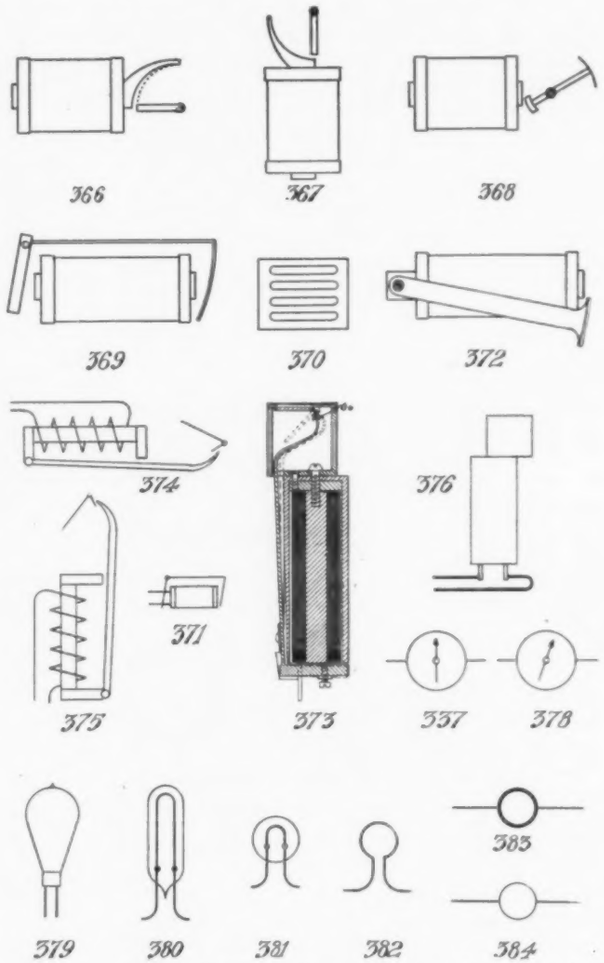
In Figs. 359 and 360 details of drops are shown which carry one of the functions of the locking drop. When the front or left-hand coil of the drop is energized the shutter cannot be tripped by the back or right-hand coil. In the upper figure the locking coil holds the magnetic armature from falling; in the lower picture the locking coil holds the magnetic reed from lifting.

It is required sometimes, and frequently in the case of very small switchboards where the attendance is not continuous, that the switchboard drop give an audible signal. This leads to the design of a combined ringer and drop, such as is shown in mechanical detail in Figs. 361 and 362. Suggested symbols for such a combined device are shown in Figs. 363 to 365 inclusive. In these symbols the rules for symbol building are observed. Fig. 363 shows a side view symbol of a drop with a ringer gong added, the gong being so positioned that it will be struck by the reed of the drop when the reed is vibrated. Fig. 364 shows the front view symbol of a drop with a ringer gong similarly added. Fig. 365, on the other hand, shows a complete symbol for a ringer, and is modified by having a drop shutter added, the ringer reed being extended to form a drop reed as well.

The three symbols here suggested show well how a standard symbol may be modified to indicate a modification or specialization in the piece of apparatus represented by the symbol.

In the class of apparatus called drops, the signal is set when the magnetic latch is operated and the signal remains set until some action is taken to restore it, whether that action be a manual operation directly upon the drop or the closing of a restoring electric circuit. The term "visual signal" has been used to designate a mechanical device operating to display a signal by changing the position of a movable part of the device, the movable part having two positions, one of which it holds during the time when the core is energized and the other of which is its position of rest and which position it assumes and maintains during the time when the core is not energized. Such devices are shown in Figs. 366 to 378 inclusive.

The symbol of Fig. 366 is very generally used to represent an electromagnetic visual signal. As the horizontal shutter moves upon its axis, its end follows the dotted line, which is an arc about the axis of the shutter, and therefore the magnetic shutter approaches the extension pole piece, the curve of which is not concentric with the axis of the shutter. The symbol placed as shown in Fig. 266 would represent probably a line signal, or at least a signal mounted in the vertical face of the switchboard, and presumably mounted behind a small window, through which the shutter would be visible when attracted to its upper or vertical position by the magnetization of the core. The same symbol is shown in another position in Fig. 367, presumably in that position representing a



Figs. 366 to 384. Mechanical Visual Signals and Signal Lamps.

signal set in the keyboard or other horizontal shelf.

The symbol of Fig. 368 shows also a movable shutter adapted to be positioned near a small window, in front of which it may swing when the energization of the core causes the weighted end of the pivoted lever to be attracted. When the core becomes deenergized the

pivoted shutter is released and the device returns to its undisplayed condition.

The signal shown in Fig. 369 is called the gridiron signal. In this signal the shutter has a very limited movement. It is positioned behind a slotted window or front plate, which is shown in Fig. 370. The face of the shutter is painted with alternate white and black lines. When in its position of rest the white lines are hidden behind the bars of the front plate and the black lines are behind the window slots. The front plate being painted black, the entire signal presents a black surface to view. When the core is energized, the armature is attracted through a small angle and the signal shutter is moved only the width of one line. This brings the white lines of the shutter opposite the window slots and the signal is displayed in white stripes to the operator. Both the side view of Fig. 369 and the front view of Fig. 370 are used as symbols for this type of signal, the symbol of Fig. 380 being used with conductors entering at any point to show its circuit connections. This type of signal forms the basis for the symbol of Fig. 371, a symbol widely used, but with many variations of the magnet spool detail.

The mechanical detail of a visual signal is shown in Fig. 373. The armature is at the bottom of the electro-

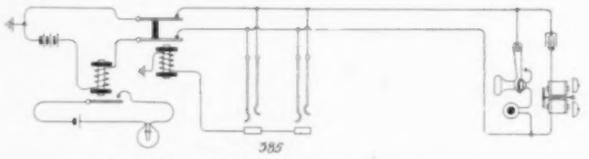


Fig. 385. Line Circuit Using Lamp Signal.

magnet core; the reed is forced away from the shell of the magnet when the armature is attracted, and a light hinged shutter is struck by the end of the reed and is swung into position in front of a signal window when the armature is attracted, remaining in that position so long as the energization of the armature is continued. This signal is symbolized in Fig. 374 horizontally and in Fig. 375 vertically as for a keyboard signal. The view taken in Fig. 376 is of the outside of the signal shell or mounting case, and lacks sufficient detail to make it a good symbol.

Figs. 377 and 378 show a dial with pivoted pointer, and with leading-in wires for circuit connections. This is the galvanometer symbol as usually accepted. It is used frequently for representing a visual signal. It is entirely noncommittal as to the mechanical detail of the signal required in the circuit. Fig. 377 shows the symbol for a device in the normal position, no current being present in the circuit in which its helix is connected. Fig. 378 indicates by the inclination of the pointer that a current is flowing in the helix of the signal. It may be noted that with this signal a double indication is possible, current in one direction moving the pointer in one angle from its normal position, and current in the reverse direction acting to move the pointer to the other angle of inclination.

A set of common symbols used for incandescent signal lamps is shown in Figs. 379 to 384 inclusive. Fig. 379 copies the usual pear-shaped bulb of the common large incandescent lamp used for lighting purposes. Fig. 389 presents the tubular lamp as used generally for lamp jacks in telephone switchboards. Fig. 381 shows an easier symbol for the draftsman, being the symbol of Fig. 380 modified to save space as well as draftsman's time. The symbol of Fig. 382 seems incomplete, but is met frequently. It is a very convenient symbol because so rapidly made in sketching, although it usually assumes the form of Fig. 381 in the finished drawing.

Figs. 383 and 384 are accepted symbols for incandescent lamps on lighting circuits. Fig. 383 represents a lamp not glowing and Fig. 384 represents a lamp glowing. This distinction between glowing lamps and dark lamps sometimes is indicated by radial lines from the symbols of the glowing lamps, indicating light rays.

Fig. 385 presents a line circuit using a lamp signal, as an exercise in circuit reading. It may be seen readily by tracing the circuits and assuming proper operation of the different devices of the symbols that the hook switch at the substation controls the glowing of the lamp at the central office, and that by working the hook lever up and down the lamp can be caused to flash again and again. It may be seen also that upon the insertion of a plug in either of the multiple jacks, in response to the lamp signal or for purpose of calling the subscriber, current must flow from the body of the jack to earth through the "cut-off" relay, the upper of the two relays, which by operation of its armatures will remove the lamp from control of the substation hook switch so long as the plug remains in the jack.

(To be continued.)

Telephones in the Boston War Game

In the war game recently played by the United States government in the vicinity of Boston, the telephone came in for its share of the honors. According to Captain Chase of the "Blues," the signal corps of the Blues during the maneuvres numbered 54 enlisted men. Thirty-two miles of wire, 40 reels, two reel carts, 50 dry cells, six acetylene lamps, four heliographs, four telescopes, eight pairs field glasses, 24 telephone sets, 36 screw drivers, two dozen pairs pliers, 1-2 bushel insulators, 24 rolls tape, and two dozen night signals were carried. The corps used six field telephones, old type, six new type, and six farmers line sets. Every set used was of the magneto type and rendered excellent service. During the first three days, 20 miles of No. 18 dampproof Duplex wire was strung to connect the division headquarters with the 1st Brigade at Mill Village, and the 2d at South Halifax. The longest line laid was from Robbins Pond to Titicut, 10 miles, on Tuesday, August 17, in the pouring rain. It took 12 hours to lay this line and eight hours to take it up. About noon on Tuesday, during the storm, the resistance dropped on this wire so that they could not ring through it. It was all right for talking purposes, however, and calls were made by cavalry buzzers. About 7 p. m. it was useless for talking, so they then telegraphed over it.

After the storm, the New England Telephone Company's twisted-pair wire had to be used entirely, the other wire being useless. This wire stood up finely and was put to many severe tests. At one time it lay in mud and water and through the swamps and woods around Robbins pond.

The greater part of the troop dispatching and outpost connection was done by telephone. After the second day the troops were so active and so continually shifting their positions that the signal work was done mainly over the lines of the New England Telephone and Telegraph Company.

The Texas Convention

The Independent Telephone Association of Texas met in fifth annual session in Dallas October 28 in the rooms of the Chamber of Commerce, two sessions being held, one at 10 a. m. and the other at 2 p. m. The convention was well attended, there being nearly 200 telephone men present. The president of the association, D. A. Walker of San Antonio, presided, and the minutes of the meeting were kept by Secretary T. A. Gould. Cecil Simpson delivered the address of welcome, Mayor Hay being unavoidably absent. C. A. Pike, general manager of the Fort Worth Independent Telephone Company, responded to the address of welcome.

In President D. A. Walker's annual report he dealt with the past, present and future of the independent telephone industry, and he reported the outlook very encouraging. J. B. Earle of Waco read an exhaustive paper on telephone legislation as enacted by the last legislature, dealing among other things with the anti-pass law and the law compelling two telephone companies in the same city to make connection. F. S. Eaton of Waxahachie read a paper on switchboard maintenance that was well received. John Spencer of Gainesville and E. H. Chamberlain of Greenville also read papers of interest to the telephone men.

At the afternoon session the papers read at the morning session were discussed. The election of officers also took place and resulted in the choice of the following: President, E. M. Chamberlain, Greenville; first vice-president, C. A. Pike, Fort Worth; second vice-president, W. E. Osborne, Cleburne; third vice-president, D. Burton, San Marcos; secretary, Leon Spencer, Gainesville; treasurer, R. M. Webb, Colorado City. The place for the next annual convention will be announced later by the executive committee.

There were present at the convention quite a number of independent telephone supply house representatives.

A resolution of thanks was voted to the retiring officers for their diligence and efficiency, to the Chamber of Commerce for courtesies extended, and to the local supply dealers for courtesies.

October 29 was independent telephone day at the state fair, and there was a good attendance of those who were present at the convention.

The Knights of the Shield, a fraternal organization composed of independent telephone men in Texas and bearing a similar relation to the Independent Telephone Association of Texas that the Hoo Hoos bear to the state lumbermen's organization, held a celebration at Turner Hall, consisting of an initiation, followed by a supper. This organization has been in existence only a few months, having been started in Dallas by several of the leading independent telephone men of the state, and this meeting was really the first big meeting held. It was held for the principal purpose of initiating into the order many of the men in attendance upon the annual convention of Texas independent telephone men.

Joint Pole Ruling in New York

Rule 25 of the Department of Water Supply, Gas and Electricity of New York, N. Y., has been changed to read:

25. *a.* Electric light and power wires must not be placed on the same cross-arm with telegraph, telephone or similar wires, and when placed on the same pole with such wires the distance between the two inside pins of each cross-arm must not be less than twenty-six inches.

b. Electric light and power wires must not be placed on the same pole with telegraph, telephone or similar wires unless the former are placed above the latter and separated therefrom by a vertical distance of at least four feet, and where the voltage does not exceed the following normal operating values:

Constant-potential metallic circuits	5,000 volts
Alternating-current series circuits	5,000 volts
Direct-current series circuits	7,500 volts
Direct-current railway circuits	700 volts

c. In the event of electric light or power wires passing down a pole carrying signal wires, the former must be enclosed in a grounded metallic covering and be suitably protected against mechanical injury, from the lowest electric-light cross-arm to the ground or to a point three feet from the center of the pole, measured horizontally.

d. Mast arms and other conducting fixtures of rigging located below the lowest electric-light and power cross-arm must be grounded. Transformer cases must be grounded unless the secondary circuits are grounded.

e. Mast arms, etc., transformers with ungrounded secondaries, and shields for conductors running down the pole must be grounded at the pole to which they are attached, and messenger cables for electric light and power must be grounded at least every five hundred feet either by independent ground wires or by bonding to ground wires already in place.

f. Transformers must not extend below and cable boxes must not extend above their respective cross-arms, unless the distance between the two groups of cross-arms be suitably increased.

The old rule read simply:

25. Conductors must not be placed upon fixtures erected or maintained for supporting wires of another class, except at crossings when approved by said department.

The report which led to the change was made by Messrs. Lacombe, Sever and Wynkoop, engineers, and is as follows:

"The old rule, the abandonment of which we are recommending, has been inherited from the Board of Electrical Control and was undoubtedly appropriate to the wire conditions and to the state of the art at the time of its adoption. With the infinitely better construction which finds favor today and with the gradual reduction of wire congestion on our principal highways, it is believed to be good policy to restrict the number of poles by requiring that all overhead conductors erected on any street be carried, so far as practicable, on one line of poles. It is believed also to be sound engineering to support upon one series of poles conductors for signaling and those for electric light and power, provided, first, that the signal wires, which are the less substantial, be placed underneath so that they may fall away from rather than upon the electric light and power wires; and second, that the voltage of the electric light and power circuits be limited to the value which the consensus of electrical opinion throughout the country endorses for this situation.

"The policy of requiring grounded metallic coverings for wires carrying dangerous potentials when brought down within reach of the public or even within reach of the signal linemen has met with some objections, either technical or financial, at the hands of the various electric companies in this city, but these alleged obstacles are not insurmountable, and, therefore, we believe should carry no weight where human life lies in the other side of the balance."

An American consul in an Asiatic country reports that a local government official has made inquiries concerning the possibility of installing a wireless telephone system. A system such as is used on lake steamers in the United States would undoubtedly give satisfaction, and the consul states that if installed by an American would increase American influence in that region very much. He adds that he is willing to give this matter his personal attention and would like to hear from American firms in regard to the same. His address is on file at the Bureau of Manufactures, Washington, D. C., No. 4133.

A Telephonic Newspaper Scoop

By Henry M. Jamison

TO PUBLISH a great speech while it is being delivered, to have the newspapers containing it on the streets as soon as the speaker has finished, and to do these things across a space of over four hundred miles which separate the speaker and the publisher—that is modern journalism. But to accomplish this wonder without the assistance of the most modern developments of the electrical transmission of intelligence would be a hopeless task for even the most efficient of journalists.

At Glasgow, Scotland, in the city hall, Lord Rosebery delivered on a Friday afternoon in September a remarkable speech on matters of supreme importance to the people of Great Britain. He spoke from two to four o'clock continuously. In its own offices in Carmelite House, London—401 miles away—the London *Evening News* reported the speech, printed it verbatim, and had its edition on the street before the speaker had left the Glasgow city hall.

This extraordinary journalistic achievement was accomplished solely by virtue of the powers of the electrophone—a specially constructed and extremely sensitive telephone devised by Giuseppe Angelini, an Italian scientist.

Had the ordinary means of telegraphic transmission been relied upon, it would have been impossible to give more than a summary of Lord Rosebery's eagerly awaited utterances.

But the importance of the promised speech at the existing juncture was such as to lead the *Evening News* to make a special effort to put London in possession of it with the absolute minimum of delay.

The task of organizing and carrying out a scheme such as this was no easy one. In the first place, the work of preparation had to be accomplished at lightning speed. The necessary permission was only obtained at 10:40 p. m. on the previous Wednesday. Two expert electricians went north by the midnight trains, and between 10 a. m. on Thursday and 10 a. m. Friday, the day of the speech, all the arrangements were completed.

Attached to the rostrum of the Glasgow city hall were the electrophone transmitters, in tiny brass fittings so unobtrusive that it is doubtful whether any of the vast audience noticed them. In the electrophone room at Carmelite House sat twelve shorthand reporters, each with a receiver at his ears.

Connecting these two distant points was a total length of 2,000 miles of telephone wires, weighing 1,600,000 pounds.

Along those thin strands of copper wire came the words of the great statesman. The well-turned phrases dropping from the lips of the speaker were caught up by the little transmitters, and with the incredible speed of electricity flashed into the ears of the waiting stenographers at Carmelite House.

For two minutes the trained pencil sped over the paper. For two minutes only, and then the timekeeper gave the signal and the writer stopped. It was the turn of the second reporter. He, too, accomplished his two-minute task, and so on down the line.

Meanwhile the first experts were transcribing their notes and handling them to sub-editors.

Scene in the "Electrophone Room" of the London *Evening News*.

Slip by slip the copy went out to the linotype operators, who rapidly set it up in type, and a few minutes after Lord Rosebery had resumed his seat in the Glasgow City Hall, London was reading the speech; the vast audience 400 miles away had hardly finished applauding.

The possibility of such an achievement says much for the efficacy of the newly invented electrophone transmitter, which gives loud-sounding reproduction with perfect articulation over very great lengths of line.

It has been tested over artificial circuits representing 3,500 miles of wire and audibly electrophones the human voice over a distance equal to that between London and Capetown.

For the day's unique achievement the telephone trunk lines between Glasgow and London became practically private wires. At the Glasgow postoffice and at St. Martin's-le-Grand the wires were temporarily disconnected from the exchange operating boards, thus connecting Glasgow and Carmelite House direct.

While the speech was being reported, one of the staff of the London *Daily Mail*, the morning edition of the *News*, entered the electrophone room. He was moved to put his impressions into the following form:

"Cardboard labels with the printed word 'Silence'

on every door in a certain corridor of Carmelite House. Guards at the top of both stairways leading to the corridor, keeping out all unauthorized persons. Office boys and messengers hurrying, but hurrying furtively, treading as though on eggshells. A long row of mats, to deaden sound, leading to a green-curtained doorway.

"What is the meaning of these mysteries; what strange secret is behind that solemn curtain, from the other side of which not even a whisper comes? I—being an authorized and privileged person—am permitted to pass within.

"A dozen or so men are sitting round a long table, down the middle of which runs a baize-covered board. Attached to the board are many wires, which are twisted together above and extend up and out of the room. Each of the men sitting at the table is holding with one hand a telephone receiver of unusual shape, fitted for both ears while with the other hand he writes.

"At one end of the table is a young man with a long bamboo wand. Every now and then he touches, with this wand, the head of one or other of the writers. As far as an outsider can tell, nothing happens when the scribe is tapped with the mystic stick—he keeps on writing, and says not a word. Standing round the table are other men—a few of them holding receivers to their ears, others looking on.

"It is a scene such as would cause a savage to depart hurriedly, howling "sorcery," a scene which even a few years ago would have been incomprehensible to any of us, would have savored of unholy magic. But, knowing what it meant, I took one of the receivers and held it to my ears. And then . . .

"I was tempted, myself, to cry that it must be magic, for surely no miracle of Paracelsus, no wonder of Baptista Porta or Cornelius Agrippa, no garden of glamor that Michael Scott created, was ever stranger than this.

"I held the receiver to my ears, and it took me away—took me like the Arabian Night's carpet—from London into a great hall 400 miles distant, where the greatest orator in the United Kingdom was delivering a speech of surpassing importance.

"Every intonation, every inflection, was as plain as if the speaker had been in the same room as myself. I listened, captivated, bewitched. I closed my eyes. Lord Rosebery thumped the table beside which he stood—in Glasgow. I heard him do it. He dropped his voice, raised it—that clear and marvelous voice. He was earnest, scornful, ironic, bitter—in Glasgow. I heard it all. I heard the applause (in Glasgow), the laughter, the 'Hear, hears,' the murmuring. He quoted a number of figures in connection with an assurance company. Every number was heard plainly at this end of the 400-mile-long wires.

"And so, from grave to gay and gay to grave, with its satire and scornful irony, its polished periods, its low-pitched sentences culminating in ringing eloquence, the speech was heard as perfectly here in London as in the Glasgow city hall. How was the wonderful thing accomplished?

"It was due to the enterprise of the *Evening News* and the extraordinary invention known as the electrophone. This invention has recently been improved—perfected, one is tempted to say—by the introduction of a new transmitter, which gives a loud-sounding reproduction of the voice with perfect articulation. The invention, as now improved, has been tested over artificial circuits representing 3,500 miles of wire—a distance equal to that between London and Capetown. That is to say, there are dazzling possibilities that may very soon become realities—possibilities that will be obvious to every reader.

"The use of the electrophone enabled the *Evening News* to print a verbatim report of Lord Rosebery's speech, the sentences being in type almost as soon as they were delivered.

"The electrophone transmitters—tiny brass fittings—were attached to the rostrum in the Glasgow city hall, and in all 2,000 miles of telephone wires were used to connect the hall with Carmelite House. Except in cities the wires were overhead. The route was from the city hall, Glasgow, to the Glasgow postoffice by underground wires, and then, by the overhead trunk system, via Carlisle railway station, Leeds postoffice, Hunslet railway station, Sheffield railway station, London road station, Nottingham, Luton railway station, and Finchley road station to the York road postoffice. Then, by underground wires, the route was to the trunk telephone exchange in Carter lane, and from there to Carmelite House.

"Twelve shorthand reporters listened to the speech in Carmelite House, each working two minutes at a time and then transcribing his notes. The long bamboo stick above mentioned was used in order to tell the reporter when it was time to begin or end a 'take.' Sub-editors saw that each piece of 'copy' was correct and in its place, and the slips were in the hands of the linotype operators almost as soon as the words were heard in London, which was four seconds after they were spoken in Glasgow.

"This year has been full of wonders, and the improved electrophone is not the least of them."

Railroad Telepones Affect Employees

Telegraph operators of all big railroad systems operating out of Chicago, particularly those using telephones, have petitioned for material increases in their wages. The minimum wage now paid operators is $57.50 a month on most roads. The grievance committees are asking an increase of from $10 to $15 a month. The contracts between the telegraphers and the railroads, while they read for a period of twelve months, may be rescinded upon a 30-day notice from either side.

A novel factor enters into the conferences in the substitution of telephones for the telegraph. Contracts now in existence on roads that have adopted telephones cover only the service of telegraph operators, so that now on the lines where the telegraphers are telephone operators they are working without a contract. It is a new contract that is now sought by the men. In addition the men ask for increased wages.

The telegraph operators claim that during the past ten years, when prices of everything have gone up, the salaries and wages of nearly all other classes of railway employes except telegraph operators have been advanced.

The substitution of telephones has become almost general on the Rock Island, Illinois Central, Burlington, Santa Fe and other lines. On the Illinois Central alone 1,500 miles of main line tracks are being operated verbally. In all cases this company, as well as the other roads, have retained all their telegraph operators, without any changes in wages, to operate the telephones.

When the telephone was substituted on the Illinois Central the officers of the company made it plain that there was no intention of displacing the telegraphers, all of whom were eligible to pensions.

Inductive Disturbances on Telephone Lines

By J. B. Taylor*

IN the various distribution schemes already discussed, the neutralizing action, if any, is the differential effect between two or more sections. At any given point there is no neutralizing action, either electrostatic or electromagnetic. Consequently these arrangements are effective only where a telegraph line runs parallel to a number of sections at approximately the same distance.

While it would be possible, it is by no mean easily practicable to have a double-trolley, single-phase railway

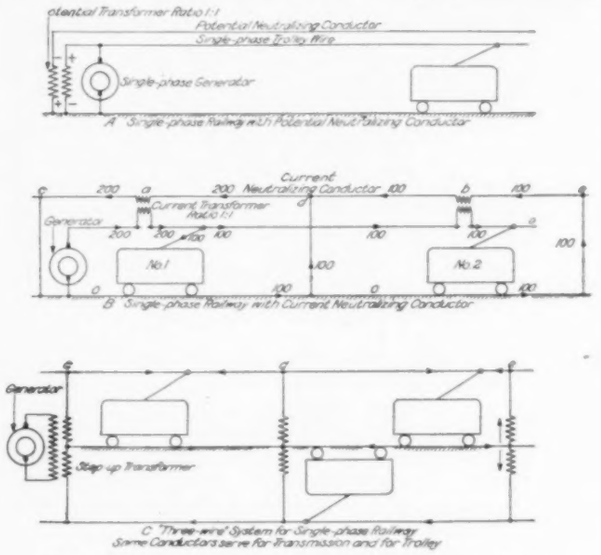


Fig. 7. Neutralizing Conductors for Single-Phase Railway.

system; and, considered inductively, such a system would be on a par with any of the other metallic-circuit, alternating-current systems.

The various distribution arrangements for a single-phase railway, as shown in Fig. 6 and just considered, require no additional conductors, although the transformer sub-stations to accommodate the special arrangements may be an added item of expense.

We will next consider the several distribution arrangements requiring additional conductors. Fig. 7 shows several schemes of distribution designed more or less to represent metallic circuit conditions, still retaining the single trolley. Diagram A shows a potential-neutralizing conductor erected in proximity to the trolley wire. By means of one or more transformers, this wire is maintained at approximately the same potential to ground as the trolley wire, but always of opposite polarity. Such a conductor will neutralize the electrostatic fields. It is more or less obvious that this neutralizing conductor might be placed nearer to a telegraph line than is the trolley wire, in which case a proper transformer ratio could be selected to neutralize the potential at the position of the telegraph wires. Such an arrangement, however, would be most effective for a single line of telegraph and would involve either extensive calculations or experiments to insure the best results. By having the neutralizing wire as close as possible to the trolley wire, no calculations or experiments are necessary, and the same wire will neutralize equally well for various telegraph lines, even if on opposite sides of the track and at various distances.

Diagram B shows a current neutralizing conductor in proximity to a trolley wire. This conductor must be of the same carrying capacity as the trolley wire, and current transformers, ratio 1:1, are cut into the trolley wire and neutralizing conductor at intervals. Midway between these transformers the neutralizing conductor is connected to the rail. The purpose of this scheme is obviously to cause equal currents to flow in opposite directions in the trolley wire and neutralizing wire. For certain positions of the cars, the neutralizing action will be insufficient; for other positions of the cars, an over-neutralized condition will result. By using a number of transformers, approximate neutralization may be obtained. The objection to this and similar arrangements is the extra expense of the neutralizing conductor and transformers, and the greater chance of shutdown due to the quantity of high-tension apparatus distributed along the line. As against the expense of the extra conductor it should be noted that such a circuit will have small self-induction as compared with the usual single-

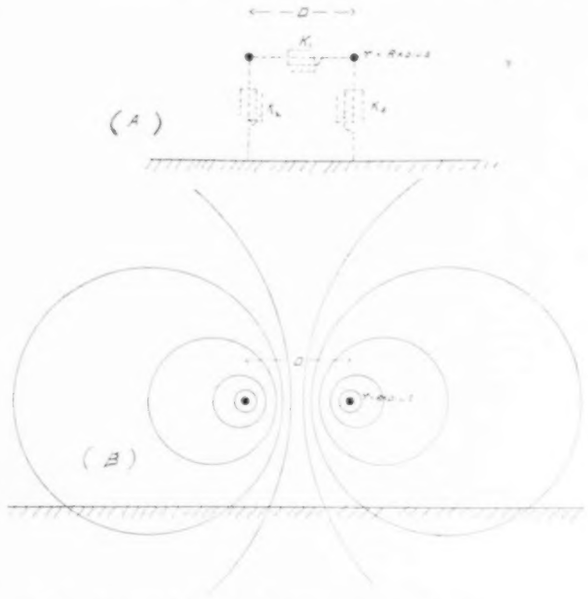


Fig. 8.—The usual formula for capacity between wires is

$$C_{\text{m. f. per mile}} = \frac{0.01942}{\log_{10}\frac{D}{r}} \quad \text{(Diagram A.)}$$

This neglects effect of capacities to earth K_2 and K_3.

The usual formula for inductance of a 2-wire circuit is

$$L_{\text{m.h. per mile}} = 0.0805 + 0.741 \log_{10}\frac{D}{r} \quad \text{(Diagram P.)}$$

This formula neglects the fact that some of the magnetic flux cuts the earth.

*Abstract of paper read before the A. I. E. E. Concluded from November.

phase circuit with overhead conductor and earth return. The inductive drop will therefore be considerably less, which may be an important factor in some cases.

By installing a potential-neutralizing conductor as described in diagram A, and a current-neutralizing conductor as well, metallic circuit conditions are approximated. A single current-neutralizing conductor of sufficient carrying capacity might serve for trolley wires over two or more tracks, and similarly single potential-neutralizing conductor might serve for more than one trolley wire, either by increasing its size or the voltage supplied to it.

Diagrams C and D show arrangements where the same conductor tends to neutralize for both current and potential. Looked at from one point of view, these arrangements are similar to the Edison three-wire system, the rail return being the neutral. Compensators, or 1:1 transformers, keep the two conductors at equal and opposite potentials from earth, and the second conductor may or may not be used as a trolley wire. In the case of a double-track road, both conductors could advantageously be used as running conductors. 1:1 current transformers inter-connecting the two conductors

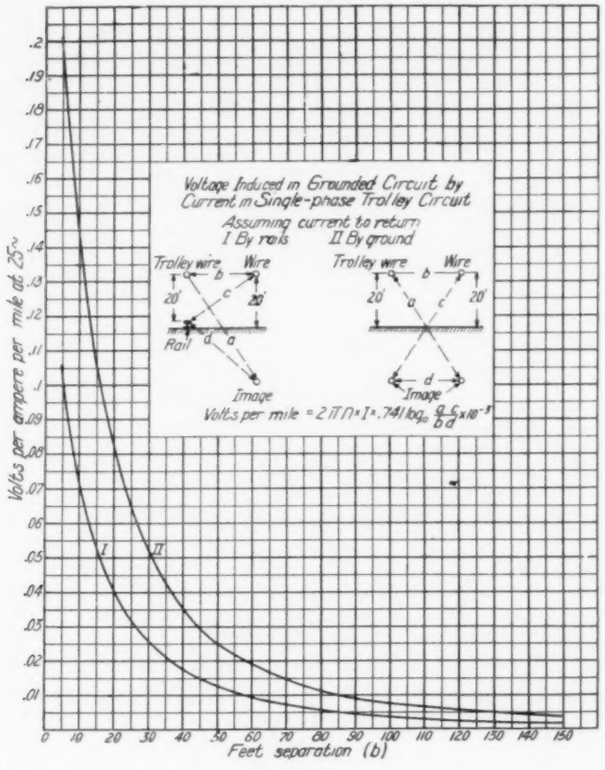

Voltage Induced in Grounded Circuit by Current in Single-phase Trolley Circuit
Assuming current to return
I By rails
II By ground
Trolley wire
Wire
Rail
Image
Volts per mile = 2πfI×I×.741 log10 d/b ×10⁻⁵
Volts per ampere per mile at 25~
Feet separation (b)

Fig. 9.

voltage. The transmission conductors thus form two working trolley conductors with neutralized electrostatic effects, and partly neutralized electromagnetic effects.

Calculation of inductive disturbances. While plenty of formulas for calculating self-induction, mutual inductance, and capacity of circuits are readily available in handbooks and text-books, the practical cases in which we are interested are, in general, very complex, on account of the number of wires at different and unknown potentials, varying distance from ground, varying distance from disturbing wires, etc. In general, a calculation of inductive effects can be taken only as showing the proper order of magnitude. Where the earth forms one side of the circuit, it is usual to assume that the earth, right up to the surface, acts practically as a perfect

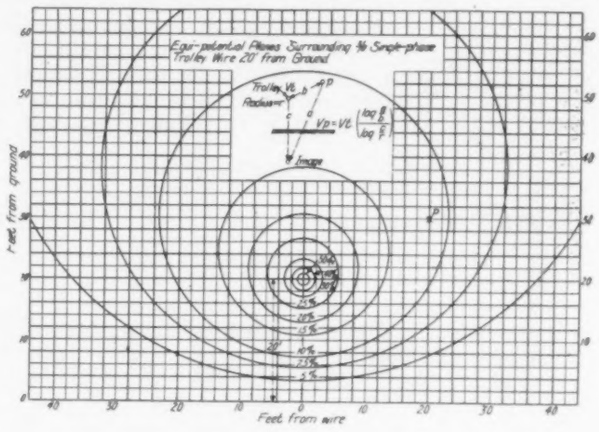


Fig. 10.

conductor. Again, other formulas dealing with metallic circuits neglect entirely the effect of the earth, which, to be consistent with the other formulas, should still be regarded as a perfect conductor in proximity to the wires under consideration. For example: consider Fig. 28.

Let diagram A represent two conductors whose capacity is to be determined. This is given by the formula:

$$C_{m.f\ per\ mile} = \frac{0.01942}{\log_{10} \frac{D}{r}}$$

It should be noted, however, that this formula, although that ordinarily given, does not take into account the added capacity due to the proximity of the earth. This added capacity may be regarded as composed of two condensers in series, as indicated. Where the two wires are comparatively close together, and a considerable distance from the earth, this additional effect may be neglected, but as the distance between the conductors is increased the effect of the earth may predominate.

Similarly in Diagram B, consider the self-induction of the circuit made up of two conductors. The self-induction is proportional to the magnetic flux included, but it is apparent that some of this flux will pass through the earth, which still being regarded as a more or less perfect conductor, will circulate eddy currents, which in their turn set up counter-flux, thus making the self-induction of the circuit lower, the nearer the wires are to the earth. Therefore, any formula for capacity or inductance which takes no account of the relative position and conductivity of the earth must be regarded as approximate only.

The purpose of this paper is not to develop mathematical formulas for the various combinations of alternating-current power circuits and telephone and telegraph circuits, under conditions which might be more or less realized in practice. As soon as we have to deal with

more than three or four conductors, the formula becomes so complicated as to be practically unmanageable. This, taken with the fact previously stated, that all these formulas depend upon assumptions as to conductivity of the earth, etc., not actually realized, and which are unknown quantities, makes it appear preferable to present two or three typical formulas and curves for simple cases, leaving the calculation of complex circuits to those who

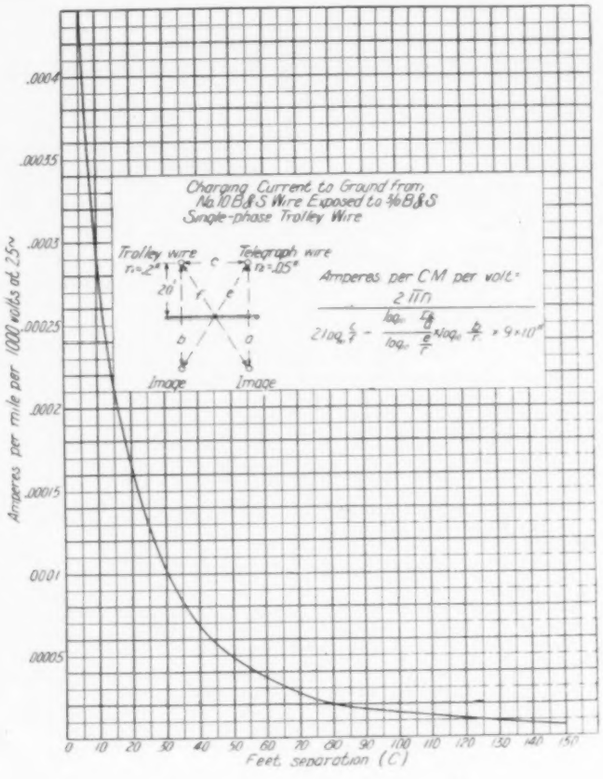

Charging Current to Ground from No 10 B&S Wire Exposed to 3/8 B&S Single-phase Trolley Wire
Trolley wire
Telegraph wire
Image
Image
Amperes per CM per volt=
Amperes per mile per 1000 volts at 25~
Feet separation (C)

Fig. 11.

delight more in mathematical exercises than in experimental determinations of value.

We must make some assumption regarding the conductivity of the earth, and the path taken by return current in the earth. In the usual formulas for capacity and inductance of circuits the assumption has been made that the earth acts practically as a perfect conductor. This assumption appears to be sufficiently exact, as far as the electrostatic effects with which we are interested are concerned, since the wires are usually at distances of about 20 feet from the earth, so that the charging currents are relatively small. Even high resistance at the earth's surface could cause the potential at the surface of the earth, beneath the wires, to differ but very slightly from true "earth" potential.

Return currents in the earth, however, are of an entirely different order of magnitude, so that the path taken by this return current will tend to be that which offers the least resistance. This return path of lowest resistance will be modified by the fact that the farther the return circuit from the overhead wire, the greater will be the inductive drop, which, in its turn, will tend to cause current to flow nearer to the line conductor. The actual or effective return, therefore, will be determined by a combination of resistance and inductive effects, in a given case depending largely on nature of soil, amount of moisture at different depths, proximity to bodies of water, water mains, gas mains, and rails of neighboring traction systems.

However, in order to deal at all with the question, it is necessary to make one assumption or the other, either that the earth is an insulator or a perfect conductor. The various formulas are based on the latter assumption. With this assumption it can be shown that the effect of distributed charge or current is the same as though this charge or current were concentrated on a wire as far below the ground as the wire in question is above the ground; in other words, on what would be the "image" of the overhead conductor if the surface of the earth formed a mirror. This means that where the earth forms a return circuit to a conductor 20 feet in the air, the effective separation of the two conductors, and hence the self-induction, will be that corresponding to a two-wire circuit with conductors 40 feet apart instead of 20 feet apart.

In calculating the inductive effects from a single-phase railway, we may, on the one hand, assume that all of the current returns by way of the rails, which will lead to too low inductive values, as some of the current is almost certain to leave the rails and return by way of the earth. On the other hand, the image assumption

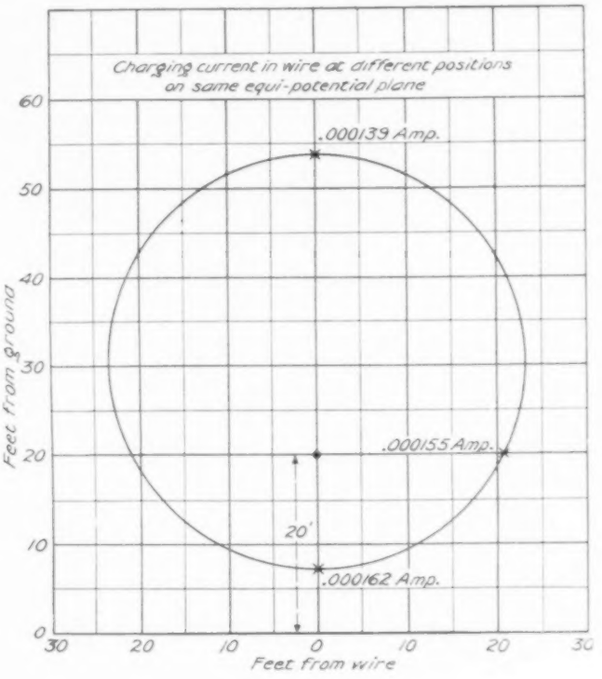


Fig. 12.

may also lead to too small inductive values on account of the imperfect conductivity of the earth. The true inductive value, therefore, will be influenced by the amount of current leaving the rails, and also on the effective path taken by this current. In the absence of definite experimental determination of inductive action in and from a given circuit, we may assume the image as the effective return conductor.

The electrostatic potential at any point depends on the relative positions and charges of other conductors in the neighborhood. The charging currents, therefore,

flowing into a grounded wire will not be the same when it occupies different positions, even though the potential on the wire when insulated is the same for the different positions considered. This is because of the reaction of the induced charge. For example, Fig. 13 is taken from Fig. 10, and the circle represents the 10 per cent potential surrounding the 000 trolley wire 20 feet from the ground. A wire occupying any position on this circle would show the same potential to ground, if measured by an electrostatic voltmeter. However, the charging current when the wire is grounded will vary for different positions on the circle. This charging current

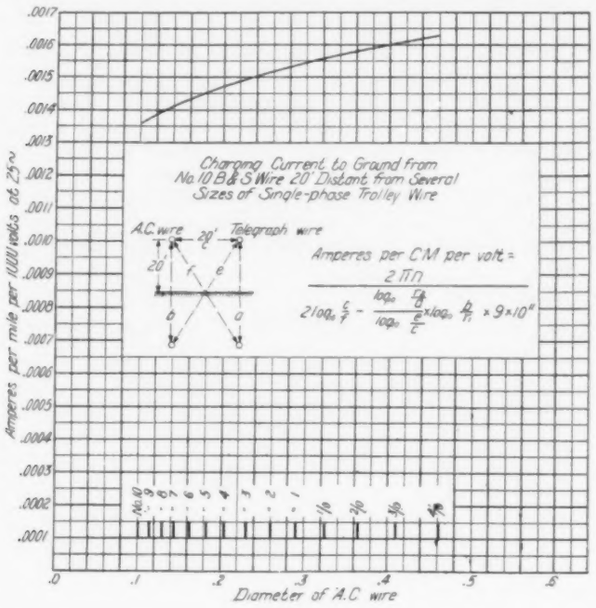

Charging Current to Ground from No.10 B.& S.Wire 20' Distant from Several Sizes of Single-phase Trolley Wire
A.C.wire
20'
Telegraph wire
Amperes per C/M per volt =
Amperes per mile per 1000 volts at 25~
Diameter of A.C. wire

Fig. 13.

will be a maximum when the wire in question is directly below a disturbing wire, and a minimum at the position directly above, and for other positions will have some intermediate value. The figures against three positions are charging current per mile at 25 cycles for each thousand volts of the trolley wire.

The effect of a change in size of wire on an electrostatically induced charging current is slight, provided the two wires are well separated. The curve in Fig. 12 shows the charging current in a No. 10 wire 20 feet from a 0000 trolley wire, and the reduction in current as this is gradually decreased from 0000 to No. 10 B. & S.

Comparison of electromagnetic and electrostatic effects. The resulting disturbances in any telegraph circuit will be due to electromagnetic and electrostatic effects; that is, the two factors must be combined vectorially, the angle of this combination depending on the power-factor of the load and various constants of the telegraph circuit. Oscillogram Fig. 14 shows current in a single-phase trolley circuit, and electromotive force induced thereby in a neighboring telegraph loop. The high-frequency irregularities on the induced wave are due to the addition of electrostatic effects. The current in the circuit due to electromagnetic induction will obviously be a maximum when all the keys are closed. An electrostatic charge will flow in from both ends of the line when all keys are closed; under other conditions this charge must all be supplied from the ground at one end of the line. It should be obvious, therefore, that the nature of the disturbance experienced will depend on whether electromagnetic or electrostatic induction is the predominating factor. Below are given in parallel columns some of the features of electromagnetic and electrostatic inductive effects.

TABLE I.

Electromagnetic	*Electrostatic*
Varies with load.	Independent of position of load (neglecting line drop).
Constant effect.	
Varies with position of car.	
Induced electromotive force in proportion to frequency.	Open circuit potential (to ground) independent of frequency. Charging current if grounded, in proportion to frequency.
Induced electromotive force proportional to length.	Open circuit potential (to ground) independent of length.
Current in closed telegraph line practically independent of length. (Assume total impedance increases proportional to length.)	Charging current when grounded proportional to length.
Induced current in instruments greatest when all keys are closed.	Charging current in some instruments greatest when distant key is open.
Practically same current in all instruments.	Current a maximum in some instruments, while zero in others.
Line resistance and reactance an important factor limiting current.	More in the nature of a constant current effect.
Generally the predominating effect in telegraph lines.	Generally the predominating effect on telephone lines.
Slight shielding action obtained from neighboring conductors.	More effective shielding action from neighboring conductors.
Part shielding obtained by placing in lead-sheath cables, or by placing underground.	Effective shielding by use of lead sheath cables.

SUMMARY.

All working conductors are surrounded by electromagnetic and electrostatic fields. These fields induce electromotive forces and charges in neighboring conductors. With an ideal metallic circuit, external fields are a minimum. Smilarly, an ideal metallic circuit may be in fields of any strength without being disturbed.

Practical considerations prevent these ideal conditions from being realized. Hence currents will be induced in any conductors wherever placed as a result of currents and potentials on other conductors. Disturbance results only when these induced currents are of sufficient magnitude to be objectionable.

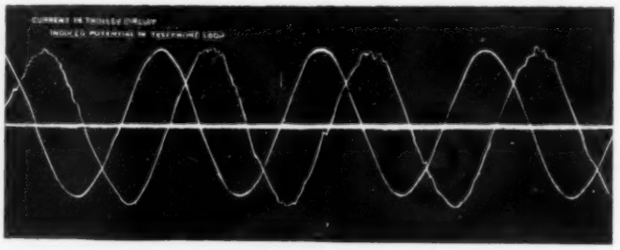


Fig. 14.

Commerical telephone lines have little margin to meet disturbing conditions more severe than normal. An increase of telephone currents to three or four times their present values would doubtless result in great disturb-

ance to other wires in the same telephone system and require new standards of construction and maintenance. The same statement applies to telegraph systems.

Theoretically a balanced telephone line can be operated in proximity to alternating current wires. This is not true of a telegraph line, as there is no way of balancing a circuit using earth return.

Where trouble is experienced on a telephone line it may be possible to clear same by putting the system in first-class condition. Where trouble is experienced on a telegraph line, some change in the apparatus or circuit arrangements will be necessary.

For any given case, all the features of the power system and signaling system should be taken into account with a view to arriving at the proper procedure to reduce or to eliminate the disturbances.

The Illinois Independent Convention

C. B. Cheadle, President.

THE ILLINOIS Independent Telephone Asociation in its fifth annual convention at Decatur, Ill., November 10 and 11, took important steps toward conserving the principle of competition in the operating field. Frank H. Woods, Lincoln, Neb., struck the keynote of the situation in his talk on "What Independent Telephone Companies Most Need." After describing the different stages in the development of telephone history, he said:

"What we most need today first is organization. Now, I think the first organization that ought to be effected in each state is a county system, or a district system. The time is past when one little independent telephone plant can be operated by itself and give the kind of service the people demand. Today they not only want local service, but good service and long-distance service. The first section they want to cover is their own county and immediate neighborhood. I think it would be a good thing if telephone companies in each county were all gathered together with one capital. If you all get together in one county and have a good county system and give first-class service, that system will be large enough so you can keep a first-class telephone man to run it; a man who knows something about engineering to lay out and properly develop the plant and to build it, and give good service. If your companies are not on a sound financial basis, the quicker you put them on that basis the better.

"When you put your plants in good condition and give good service, you want to see that men who put money in your plant receive dividends and receive them regularly. It is no trouble for any company to earn dividends. Put telephone plants on a business basis; give the people the very best of service; they won't put up with anything else. In this day of competition you've got to keep up with the procession—not only keep up and get ahead, but keep ahead. The trouble with us in Nebraska for a long time was that we were all the time stewing and worrying about what the other fellow was going to do; instead of developing our own plants we were running around the state to keep our neighbors in line.

"In Nebraska we have had a clearing house the last two years, handling a large volume of business and doing it very successfully. We got out a directory, and the directory hadn't been out ten days before we found a great increase in our toll business.

"I think the outlook for independent telephones was never as bright as it is today. I have been closely associated with the work several years, have been connected with committees and state association, attended different meetings and conventions, kept in touch with it, and I see that the time never was when we were in as good shape as we are today. Of course there are a few clouds on the horizon, always will be, but what are those to a strong body of men with millions invested?

"Get together and form a system of association, and when you have once gotten that system formed, our opponents will recognize that you have established yourselves in a stronghold and that you are here to stay, and they will stop fighting. The day of destructive competition in the telephone business is near an end; we are going to have an era of constructive competition. If you have to fight, get together and preserve what you have, and we will have the most successful business on earth. The telephone today is a necessity. The people want this service good, will continue to want it. You have the facilities to furnish it and you have the ability to operate it. Get a system founded on home ownership, operated by home people, and you are bound to win out against any competitor. Let's stand together and win the victory and let's clinch the victory we have already won."

Mr. Woods devoted considerable time to describing a plan of organization, and at the close of his talk J. W. Collins of Decatur made a motion that the Illinois association form such an organization, which was carried. On motion by C. B. Cheadle, Joliet, a committee of three was appointed to discuss the proposition.

Mr. Cheadle spoke on "Organization." He said in part:

"Carpenters call certain kinds of timbers, 'shakes.' They are those that were cut from trees that were dead. They are practically worthless. There are lots of shakes in the telephone business. Lots of companies have more shakes than anything else. We need men to form our organization, men of character, energy and integrity, men who know, who are honest and truthful. If you don't have these, your organization will be weak.

"No company can hope to prosper to the limit of its opportunity that does not keep a full, accurate and permanent record of the material facts concerning its business. Know your business. Knowledge of value will tend to enable you to increase your earnings, reduce your expenses and increase the efficiency of your service.

"Knowledge being thus the end and aim of organization, it is necessary that a company be so organized as

to obtain the greatest amount of useful knowledge. And here again comes the matter of character of your employees. You may say I am attempting to run a school of morality rather than a telephone business, but listen: If you fail to heed the character of your men and women, too, they will shortly give to your business a character that will mean loss to you.

"Every employee should, from the highest to the lowest, be expected to do his duty, and he cannot know his duties if he is subject to the direction of more than one superior. Every employee should be subject to one and only one superior head. The moment this rule is disregarded, the way is open for the shifting of and escape from responsibility, with consequent confusion, discord and neglect of duty.

"Cultivate among your force a spirit of fraternalism and mutual helpfulness. Make them feel that they are a part of your organization, that the company's success is largely due to their co-operation. To this end, I urge the holding of meetings at stated times, at which as nearly all the employees as possible shall be present. Talk over the affairs of the company frankly and let each point out how improvements may be made. See that every suggestion has due consideration. Make each one feel that he is an intelligent part.

Continuing on the relation of companies to each other, he said that many independent men, who if they would work in harmony with other companies could form a strong protective organization, "had given themselves over to petty jealousies, foolish strife and wasteful animosities and had busied themselves avenging fancied wrongs. Get these and the desire for unfair advantage out of a group of companies and men of sense into them and you can effect an organization that will put the octopus out of business as far as the group is concerned.

"Here, again, I commend to your thoughtful consideration the voting trust. If this plan of mine seems too Utopian for present-day conditions, we can at least form county or group organizations which can be made most effective and remove the condition of chaos heretofore existing. Let us harmonize our relations with each other. Let us in short be prepared for systematic co-operation and being prepared, enter into such systematic co-operation with soul and spirit.

"Having the strength of a Samson, the independent man has been a pigmy in his relation to all except pigmies. He has trembled and turned pale lest the octopus should swallow him, forgetting that the people must be reckoned with and that they are ever ready to aid him if he is worthy. But he must deal fairly with the people."

C. B. Cheadle of Joliet, president of the Decatur Home Telephone Company, was elected president by a unanimous vote. Other officers elected are: Vice-president, F. C. Woods, Galesburg; secretary, M. B. Farwell, Bloomington; treasurer, W. W. Holiday, Jacksonville; executive committee, William H. Bassett, O'Fallon, Ill.; L. A. Herrick, Freeport; W. W. Holiday, Jacksonville; Mr. Glendon, Pittsfield; Manford Savage of Champaign, and the president and secretary, ex-officio members.

Before leaving his chair and turning over his office to the newly elected president, Manford Savage, the president, made a short plea, urging upon the men that they must stand united not so much to protect themselves from the Bell Company, but to protect themselves from themselves.

The committee composed of Mr. Cheadle, Mr. Bassett and Mr. Herrick to draw up resolutions for a more thorough organization and for taking up the clearing house matter reported as follows:

"*Resolved*, That the Illinois Independent Telephone Association, in regular convention, heartily approves the general plan outplined for a closer union of the independent telephone companies of Illinois and for the adoption of the plan in its general terms.

"*Be it further resolved*, That this convention appoint a committee of five persons, of which the president be one, whose duty it shall be to work out in detail the plan above mentioned with the view of making it the most effective possible to conform with the laws of the state of Illinois, and that said committee be empowered to take the necessary steps to incorporate a company and complete an organization thereof and to solicit membership."

This met with the approval of all and the executive committee was appointed for that work. Representatives of various companies favored the plan, but some did not care to commit their companies to any binding agreement until they had taken the matter under advisement with their board of directors. For this reason, it was decided that the committee shall go ahead with its work, plan the reorganization as such, and then the president of the association will call a convention for the express purpose of forming the organization permanently. This meeting, it is thought, will be in the spring. An endeavor will be made to have every independent company in the state represented and to join in the combine.

Interesting papers were also read on "County Organization," by L. A. Herrick; "How to Make Rural Exchanges Pay," by G. F. Wombacher; "Private Branch Exchanges," by W. G. Olwin; "Fire Insurance," by James B. Hoge, and "The International Association,'" by J. B. Ware.

Among those registered at the convention were: C. A. Camp, Herzog, Ill.; George Spitler, Mt. Zion; J. B. Farwell, Bloomington; J. S. Tompkins, Chicago; F. F. Reasem, Chicago; I. L. Long, Assumption; H. G. Farwell, Terre Haute, Ind.; Dr. A. B. Storm, Windsor; C. H. Storm, Windsor; George Garrison, Windsor; S. O. Harrison, Windsor; H. D. Funk, Waverly, Ill.; C. M. Fleming, Shelbyville; A. D. Loehr, Carlinville; C. A. Harris, St. Louis; C. M. Erwin, Macomb; G. F. Waubaily, Mascoutah; L. A. Herrick, Freeport; C. B. Cheadle, Joliet; P. J. Eubanks, Chicago; R. S. Mitten, Chicago; F. W. Grewall, Chicago; F. H. Holroyd, Genoa; Russell H. Skeets, Altamont; L. G. Le Bourveau, Chicago; H. S. Greene, Chicago; A. P. Shaver, North Henderson; John E. Severs, Alexis; Michael Loftus, Ivesdale; M. A. Cook, Ivesdale; J. C. Cussins, Niantic; P. H. Woodruff, Chicago; F. C. Woods, Galesburg; J. S. Campbell, Tuscola; C. J. Tucker, Warrensburg; T. C. Ainsworth, Pana; E. B. Gibbs, Elyria, Ohio; Elmer E. Daicey, Champaign; J. B. Sildorff, Benson; J. H. Drauyer, Bradford; William G. Olvin, Peoria; Jasper Blackburn, St. Louis; Manford Savage, Champaign; C. M. Kimball, Taylorville; Martin E. Connard, Elwin; L. Cazalet, Assumption; F. E. Taylor, Assumption; W. H. Ramsey, Auburn; G. S. Montfort, Lafayette; C. E. Connard, Decatur; Dewey Newman, Chicago; George H. Crandall, Springfield; Vinton Garrett, Atwood; E. A. Purcell, Taylorville; J. A. Arenz, St. Louis; C. Lewis, Chicago; J. W. Collins, Decatur; Charles Watkins, Assumption; J. M. Poorman, Decatur; J. W. Wylie, Decatur; P. D. Myers, Lincoln; G. C. Jeffers, Carmargo.

Majorana's Wireless Telephone System

By H. J. Reiff*

THE Majorana system of wave telephony is of great interest and practical value, and a description of it will be of interest.

The transmitting apparatus includes a generator of almost undamped oscillations, but Majorana combines it in certain cases with the Poulsen apparatus for completely undamped vibrations. The special feature, however, is a hydro-electric microphone connected with the mast wire, supplying sounds corresponding with the undamped oscillations. The apparatus is represented diagrammatically in Figs. 1 and 2. The coil S, together with the condenser C and the self-induction L, produces the waves. A is the air wire coupled inductively with the coil T. E is the earth, and the microphone M is between it and T. The microphone is a bell hydraulic telephone. The water S falls through the opening O on to a pointed wire P fixed vertically under O (Fig. 2). P is surrounded by an insulating ring I, itself surrounded by a broader ring R. The continuous current of a telephone is connected with both R and P. When the water, to which conductivity is imparted by means of a little sulphuric acid, falls over the sharp end of P and the ring R, it establishes a circuit for the telephone current above mentioned. If the flow of water is made intermittent, the telephone circuit is correspondingly made and broken. This is produced by certain sound waves falling on the stream of water and breaking it up into drops. The waves are sent to O through the funnel T and the membrane M.

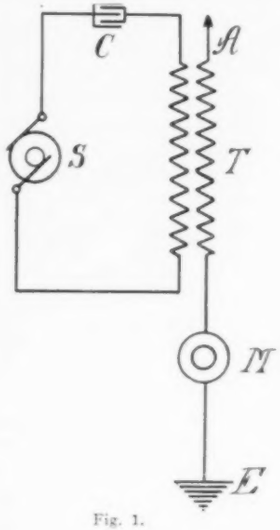


Fig. 1.

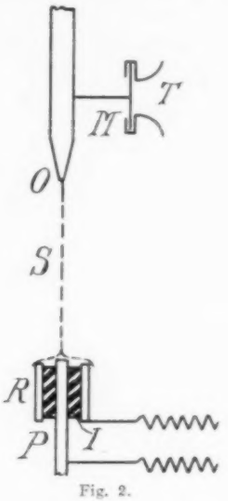


Fig. 2.

The novelty in Majorana's arrangement is that in using this well-known form of microphone, its defects in reproducing the human voice are eliminated. This is done by connecting the water supply pipe Z (Fig. 3) by means of a rubber connector G with the pipe A ending in the fine jet O in Fig. 2, from which the water finally issues. A is made of much thinner material than Z, and this, together with the flexibility of A, enables the delicate variations of the human voice to be transmitted to the telephone almost unchanged.

Another advantage of the Majorana system is that it can utilize currents of greater voltage, as well as of greater amperage, than has hitherto been possible without loss of sensibility or accuracy of reproduction. With high voltages, the distance between P and R can be increased within reasonable limits, and the apparatus is equally suitable for high amperages, because the water conducting the current is constantly renewed, so that there is a continued cooling of the whole apparatus. This is the secret of the power of the Majorana arrangement to telephone over great distances.

For the receiver, Majorana resorted first to a Marconi electromagnetic detector, but found it deficient in the reproduction of the human voice. He finally resorted to a thermo-electric scheme shown in Fig. 4. A is the antenna, T an adjustable self-induction, and E the earth. The coil L is under the induction influence of T, and with the condenser C makes the oscillation circuit. Parallel with the condenser there is a smaller one K, and the thermo-electric contact P. This consists of a plate of iron pyrites, which can be pressed upon by a platinum screw. A difference of potential is caused between the two by the heating caused by the passage of the electric waves, and hence a current passes through the telephone. Majorana has also made use of DeForest's receiver, the so-called audion. This is represented in Fig. 5. A is the antenna and I the earthed self-induction of the receiving circuit. The audion consists of the exhausted glass globe G, containing a carbon light filament F, which is ignited by the battery B^1; G also contains a wire netting R, filling nearly the whole diameter of the globe. Opposite to it, and also inside G, is the metal plate C. The negative pole of F communicates with R through a condenser K and the coil J. The rest of the circuit includes the 30 volt battery B and the telephone T.

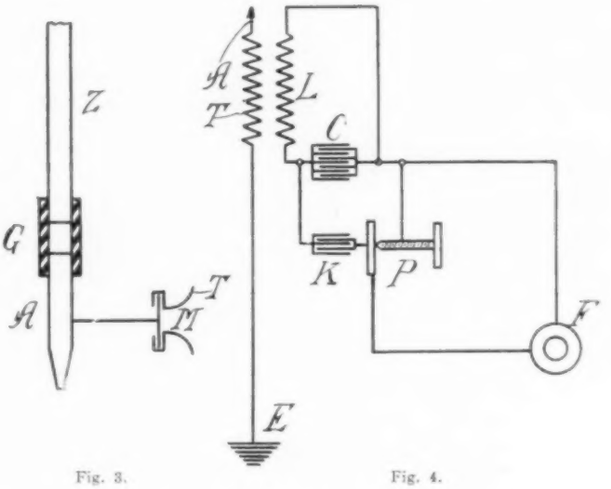


Fig. 3. Fig. 4.

When no message is being received, a weak current, nevertheless, passes the telephone, for the incandescent

*Translated from *Der Elektrotechniker.*

filament *F* is continually emitting electrons, some of which pass through *R* on to *C*. If waves reach the antenna, the coupling of the two coils causes a difference of potential between *R* and *F*, and all the electrons emitted from *F* are stopped by *R*, so that electrical communication between *F* and *C* is suspended, and the current in the telephone ceases. In this receiving apparatus the transmission of acoustic vibrations is effected by altering the difference of potential between *R* and *F*, whereby the number of electrons passing from *F* to *C* is also changed in the same proportion as the intensity of the waves, *i. e.*, in correspondence with the acoustic vibrations from the sender of the waves.

By using this arrangement, under the patronage of the Italian Navy, Majorana has succeeded in telephoning

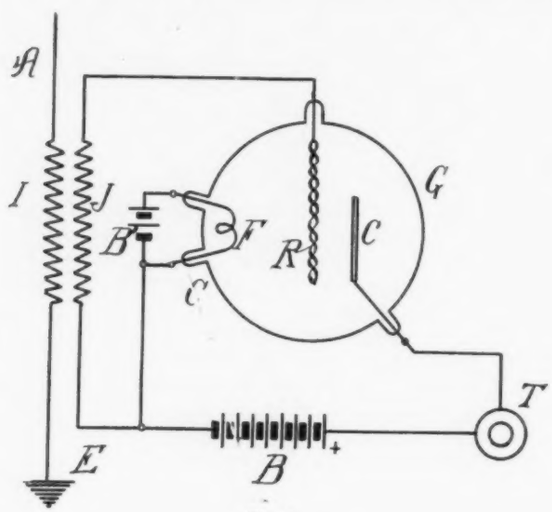


Fig. 3.

without wires over a distance of 260 miles. This result was obtained between Rome and the coast of Sicily, in a district where there are numerous wireless telegraphy stations established, so that there was every possible chance of interference by electrical waves from them. Nevertheless, the tone and accent of the speaker were exactly reproduced. This is a characteristic property of wave voice transmission, which is effected quite independently of the acoustic vibrations, and is conspicuously absent in the ordinary wire telephony. The only part of the apparatus that might possibly affect the recognition of the voice in the Majorana apparatus is the membrane *M* and the outflow jet *A*. These might, on occasion, set up vibrations of their own which might strengthen or weaken, or even altogether drown the sounds wanted. It is said, however, that they are so dimensioned and arranged, that they cannot affect vibrations coming within the compass of the human voice.

Opening the Gunnison Canal

The Gunnison canal is the largest underground waterway in the world. The main tunnel is six miles long, through a mountain of almost solid rock, from the Gunnison river to the Uncompahgre valley of Colorado. It is thirty feet wide at the bottom, eighty-three feet wide at the top, and the water in it is ten feet deep. It took four years to build it and cost more than $2,500,000.

The Gunnison canal was opened September 23 by an electric impulse sent over the lines of the Colorado Telephone Company from Lujane by the hand of President Taft. Before it was positively known that the President would make his western trip the telephone company tendered to the executive committee at Montrose the use of a telephone circuit from Washington, D. C., or Beverly, Mass., to River Portal, Colo. The coming of Mr. Taft to Colorado obviated the necessity for this, however, and it was finally decided to have the President visit Lujane, the government town at the west portal, and there press a button which would open the tunnel gates. As the Colorado company's lines serve the town of Lujane and extend on over the mountains to River Portal, it was not difficult to provide for such an arrangement.

When it came to designing a device, it was decided to get away from the old-fashioned telegraph key or the push button, and to furnish something unique and attractive. The device finally hit upon consisted of a mahogany box six inches wide, eight inches long and six inches high, in which was mounted a sliver plate with contacts to operate similar to a burglar alarm mat. This plate was etched with a map of the Uncompahgre valley, the etching being filled with black enamel, making a very handsome piece of work. The box also contained a beautiful bell, three inches high, made of eighteen-karat Colorado gold, and weighing five and a half ounces.

When it was learned that the opening ceremonies would be held at Lujane, and that, owing to lack of railway facilities, only a comparatively small portion of the crowd could leave Montrose, a circuit was arranged so that when the President placed the gold bell on the plate, operating the mechanism at the tunnel gate, it would also ring large gongs on the principal street corner in Montrose and also opposite the grand stand at the Western Slope Fair, where thousands of people would be congregated. Over these bells were erected immense signs explaining that the bells would ring when the President released the water.

When the great day finally came over 10,000 people poured into Montrose. At Lujane on a platform at the portal of the tunnel, the bell was presented to the President by John F. Greenawalt, representing the Colorado Telephone Company. The President placed the bit of gold on the silver plate, and in a few minutes the water came rushing out upon its mission to reclaim a desert. And, at the same time, the bells rang in Montrose and at the fair grounds, announcing the conquest of the desert.

Wire Insulation by "Enameling"

Insulating wire by means of a thin coating of enamel originated in America, but the *Anzeiger für die Draht-Industrie*, Berlin, the organ of the German wire-working industry, states that Allgemeine Elektrizitaets-Gesellschaft, the German electrical concern, has succeeded in insulating the finest wire (down to 0.05 millimeters diameter) with enamel of low cost, doing away with the expensive acetate wire.

Enameled wire effects a considerable saving in space, and illustrations which form part of the article show space comparisons between spools insulated with various materials. The spools consist of 10,000 windings, the wire being 0.2 millimeters in diameter. The enameled wire consumes hardly any more space than bare wire, and where wire is bought by weight the advantage of this method of insulation is obvious.

Some Questions Answered

By J. C. Kelsey

[This department is at the command of our readers. Questions relating to all branches of telephony—technical, financial, ethical, or otherwise—are invited, and will be answered in the order received. Names of inquirers will not be used unless desired.—*Editors.*]

"Being a constant reader of TELEPHONE ENGINEER, I am taking the liberty to submit herewith a query, an answer to which in one of your numbers would be greatly appreciated.

"(a) Why are telephone induction coils not designed similar to alternating current transformers, which have a closed magnetic circuit?

"(*b*) For a local battery set under ordinary circumstances, what should the ratio of the primary to the secondary voltage be in order that the coil may be of the highest efficiency?

"(*c*) For a common battery set, under ordinary circumstances, what should the ratio of the primary to the secondary voltage be in order that the coil may be of the highest efficiency?"—T. C. W.

(*a*) Telephone induction coils are not designed along power lines; very little telephone apparatus is.

Transformers built for power have to operate usually on very low frequency, ranging as low as 25 cycles.

The amount of work done by a transformer depends upon the number of lines of force produced by the primary winding. The secondary winding is merely an arrangement to distribute the energy at the proper potential. Distribution can be effected without a secondary winding—simply by tapping the primary winding at proportionate points.

The number of lines of force for given excitation depend upon the length of the core and upon the area of the core, as well as the permeability.

The permeability of the air gap is known as 1, and you can see that it is essential that the magnetic field have as little air gap as possible—hence the closed magnetic circuit.

By imagining the difference between the power used in talking and the power used in lighting your city, you can see that the energy handled by the telephone coil is insignificant. It is practically a static coil—passing no real power.

The frequency is so high—running up to 3,000 cycles—that the less iron you have, the less will be your reversal or hysteresis losses. You need no iron at all, in a way, although practically you know that any inductive work requires some iron—so you hear of the talk—through coils, which can be covered in your hand by your fingers.

You have so few lines of force to generate, that you have more than enough ampere turns to overcome the reluctance of the open magnetic circuit.

You can talk through closed circuit coils, because you have combination circuits in which you ring through as well as talk. Hence in ringing, you are required to transmit some evidences of power at low frequency, therefore a more considerable amount of iron and a magnetic circuit is necessary; so that the limited number of ampere turns can excite the core satisfactorily.

(*b*) There is no such a thing as efficiency in telephone practice. The ratio of the primary and secondary in local battery practice is founded on resistance of respective coils rather than turns. The secondary windings are based on whether the coil is to be used on the ends of talking circuits or in the middle.

The operator's induction coil is in the middle of a circuit, as it were, and has a high resistance secondary winding to keep from cutting down the chances of good transmission between two end or talking subscibers.

The subscriber's coil is lower, because if its impedance is too high, it would seriously impair the transmission, because the secondaries are in series in the circuit. You know that a high frequency voice current has a hard time soaking through impedances.

The voltage of the secondary and primary is the same, as there is no stepping up or stepping down in voice currents. There may be a tendency to step up to higher voltage, but the primary circuit is not an elastic medium, as it were, and it does not respond to counter electromotive forces set up by demands upon the secondary circuit.

If you short circuit a secondary winding of a power transformer, you blow the fuse on the primary side, because you have killed the counter electromotive force power of the primary winding, and current tends to rush into it as a bare low resistance circuit.

But your telephone circuit offers no response like that—consequently your coils could have even primary and secondary resistance, as far as efficiency is concerned.

(*c*) Common battery coils follow the same rules, as regards efficiency. Here you find practically the same resistance in both primary and secondary windings.

It seems that telephone designing is a cut and try science so far. When you compare electric power, dealing with a low frequency, to telephone practice, dealing with all the minute frequencies that tend to make you recognize the voice, you are bound to realize that there is a difference.

Some day there will be a more exact method of doing things, as there are now instruments dealing with small currents, which are proving of value in getting much valuable and actual data.

* * *

Strange to say, last week I got my first peep at the celebrated market letter issued by the Central Union Telephone Company at Indianapolis. The author of it is ostensibly a broker, in addition to being considerable of a kidder. He has a beautiful name, that must have been gathered from a fairy story, or from the Laura Jean Libby series.

The banker who had received the market letter was fully conversant with the humor it carried and was about to consign it to a waste basket when I asked him to look it over with me. So we took a little time to look over the list of juicy licensee investments mentioned.

The author has no shame at all. He mentions Central Union, Missouri and Kansas, and other examples of widows' investments. We marveled at the vast amount of enthusiasm that must abide in the bosom of the Central Union stockholder. We marveled at the joy of the employees of the New York Telephone Company who put all of their savings into the Central Union stock because Mr. Sabin, of late lamented memory, was coming eastward with brass band tactics to stir up lethargic Ohio, Indiana and Illinois. For, gentle reader, the Bell rejoices not only in Wall street money, but in the hard earned saving of its employees.

We also notice that the Missouri and Kansas Tele-

phone Company was listed. Only last week I heard a full account of the treatment of stockholders from an industrious railroad man who invested in this gilt-edged security. He was in doubt whether the trouble was due to criminal intent or to carelessness. I could not enlighten him.

Strange to say, the alleged broker mentions naught about Western Electric stock. They don't want to sell it. So many of the Bell licensee companies have compared the value of Western Electric stock to their own, and have accordingly cried about their prices. Since then, the Western Electric Company has obligingly shown no profits.

So the banker was fully acquainted with the situation. The letter does no harm. A confessed liar is just as reliable as a truth teller. If you know a man is a liar, you can always get the truth out of him by reversing his statements.

I told the banker, who handles millions in a territory outside of New York and Philadelphia, where there is real investment money, about some independent telephone developments not mentioned in the market letter.

I told him about Theodore Gary's magnificent plant at St. Joseph, Missouri. No plant anywnere has such suitable buildings and distribution—and there is no water anywhere. Such news would pain the Bell press bureau. And such impudence too! According to Bell logic, buying Des Moines should have frightened Mr. Gary and all his associates—but they are like American soldiers who won't be whipped just because they are told they are.

Telephone service is a local issue. Long distance telephone business is a joke except in rare cases. It is rentals that pay expenses and dividends. St. Joe can live without Des Moines.

This banker knew all about the new Continental Company and was pleased with its possibilities. He knew something about the Brailey matter and he decided in his mind that the Postal interests were behind the deal, and that all talk of Bell was rot. He knew that the Bell and Western Union interests had joined forces, and he thought that the addition of the Western Union liabilities would weaken and not strengthen the Bell interests. He was even so far interested in independent possibilities that he promised to attend the independent convention on the 7th, 8th and 9th of December.

So the market letter had better be sent to the waste basket in advance. If these people only knew it, publicity is what they do not want.

Had the Bell interests kept still at Jackson, Mississippi, the Home Telephone Company would have had to spend lots of money on solicitors. The Bell company, however, kindly gave it all the publicity needed, so that every man, woman and child heard of the new telephone and wanted it.

A prominent telephone company in Michigan was worrying about the fact that it had no net gain for the past quarter. The Bell heard of it—kindly put in forty solicitors, and when the storm blew over had a few new subscribers, while the independent had a net gain of 350 unsolicited subscribers, and which did not get the first quarter free either.

I know several rate-raising cases that would have failed had the Bell company and its attorneys not butted in. That made the authorities sore and they granted the raises.

Aesop in his fables tells of the great bluff the ass made, while nicely wrapped up in the lion's skin. When he finally opened his mouth to roar, as the frightened villagers expected, he brayed and was severely beaten for the joke.

Oh, you Hayrick!

* * *

My old grammar had a sentence which read this way: "Truth is stranger than fiction."

Last month I referred to the Platt family and a minor stockholder's suit for relief. An express company row. Now comes the news that a record breaking melon has been cut by an express company and $300 cash dividends and other gifts were numerous. Others are to follow.

And still further, some Chicago minor stockholders of the B. & O. railway are suing for relief from financial oppression. And in passing, the attorneys for the minors in this case are no other than counsel for the Bell concerns in Chicago. If you would read what these attorneys had to say, their pitiful plea would stir your heart with grief.

The minor stockholders of the Western Electric Company or any licensee company, for that matter, have as good a case as the minor stockholders of the express company, but the average minority investor in Bell securities is a mollycoddle. None will fight. Somehow the Bell interests have ever been lucky in securing weak-kneed minority investors. It is the kind they need, and it is the kind they have, and they know how to handle them.

Suppose you and others organize a coal company. John Smith owns 80 per cent of the stock and is also president. He names the directors.

Suppose John Smith uses the coal at his house and factory and gets it for nothing. Suppose he uses the company to provide jobs for his sons-in-law and others, and pays them unusual salaries. Suppose he uses the company's money to build warehouses, to store coal for the benefit of his own industries, but entirely an expense to the company you are interested in. Suppose John offered you $225, or half what your stock was worth—or he gave you choice of trading for stock in another of his enterprises. Suppose John told you that you would be sorry if you did not trade—because the company was losing money, and you had better get out. All the time you know business was never better. Suppose John manipulated the books so that the book value was $225 and getting less every year, and you knew that all real estate and buildings were carried on the books at half of their cost. And you knew, too, that buildings and real estate bought ten years or more ago were secured much cheaper than you can get them today. When you know the book value of the plant is nearer $350 and the real value is near $500.

Well, this is the Bell game in the Western Electric and other of its licensee companies. If you will consider the square blocks and fireproof buildings in cities like Philadelphia, St. Louis, Minneapolis, Kansas City, San Francisco, Dallas and numerous other thriving points, in addition to acres in downtown Chicago and New York, besides real estate and buildings in nearly all the kingdoms of Europe, you would be pleased to offer them $11,000,000 for it. That is what they carry them at in their asset column.

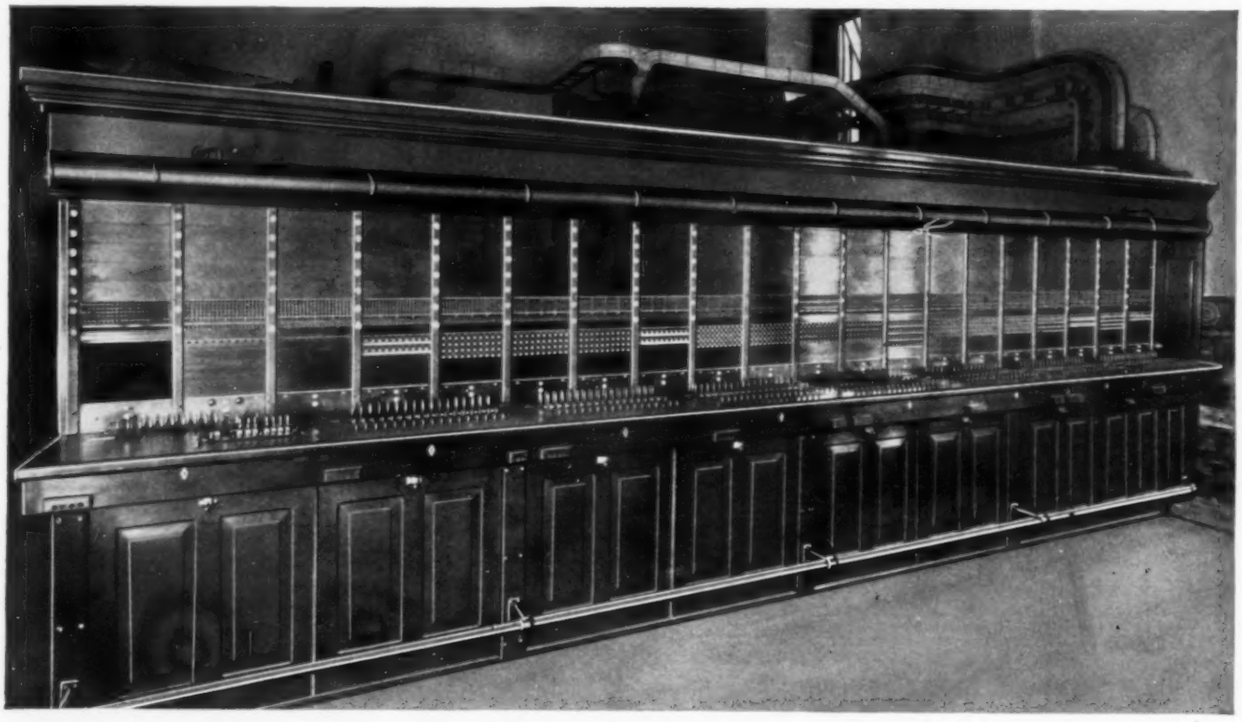
O, you minor stockholder! What a complacent easy mark you are!

Philadelphia Municipal Telephone System

W. D. Lindsey

THE centralization of the official lines of communication in the city of Philadelphia has recently been made complete through the installation of a municipal telephone exchange. Through this exchange is carried on all municipal telephone service in connection with the hospitals, fire houses, police stations, pump stations, department bureaus and city offices.

The exchange is located in the City Hall of Philadelphia and has been in service since July 25, 1908. It is thoroughly equipped and one of the largest telephone exchanges in any municipal building in the world. The new equipment consists of two four-position standard switchboard sections, accommodating seven regular operators and one testing operator. This board has a capacity of 700 local lines and 200 trunks. There are now a few more than 500 local stations served from this switchboard, and 100 trunk lines are in use at the present time to the telephone company's central office. All of the trunk lines are equipped with a visual busy signal, that is, with each multiple jack of the trunk line which appears in front of the operators, there is an associated green light, the lighting of which indicates to the operator which trunks are busy and which are free.



View of Switchboard, Philadelphia City Hall Exchange.

The city owns an extensive system of underground conduits, which is supplemented by the privilege to use one duct in every conduit owned by private corporations.

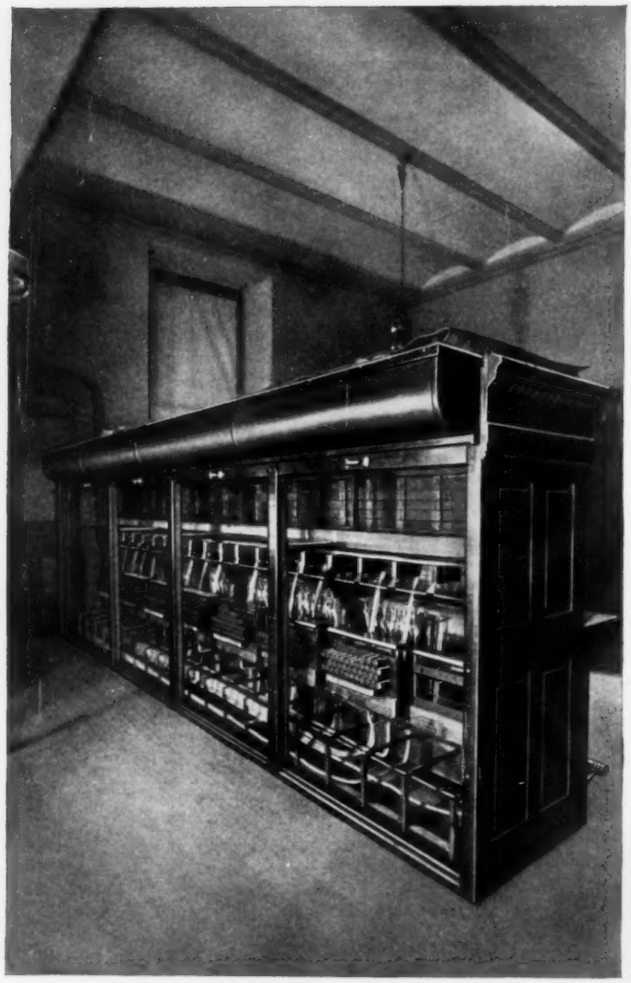
There is quite an extensive cable system, the smallest conductor used being No. 18 B. & S. The longest haul connection is from the Holmesburg police station to the Chestnut Hill police station, through the City Hall, approximately forty miles of underground cable.

These underground cables enter the basement of the City Hall through what may be termed "vaults." They are then spliced directly (that is, without fuses or other protective devices) to cables that are hung in a vertical shaft, and are then terminated on a distributing frame which is similar to the standard equipment found in large telephone exchanges. The capacity and equipment of this main frame corresponds with that of the switchboard. An idea of the amount of work upon an installation of this character may be gleaned from the fact that there are over 100,000 soldered connections on this frame.

The switchboard described above is for general municipal use, and of standard Western Electric manufacture similar to the type furnished to operating telephone companies. The police business is handled over what may be termed a "private police telephone system." The police private branch exchange switchboard is located in police headquarters. It has a present equipment of 80 local stations and 20 trunk; 10 of these trunks being to the main municipal private branch exchange switchboard.

All of the police stations, located in various parts of the city, are connected with this police private branch exchange.

The terminal equipment of these police telephone lines, at the various station houses, consists of a standard telephone set, equipped with a chest type transmitter



Rear of Switchboard.

and double head receiver. The house sergeant is the man designated to look after the receiving and sending of all telephone messages. A standard typewriter desk (such as is usually found in offices) has been converted so as to allow the house sergeant to receive and transmit telephone messages while operating the typewriter. An arrangement of jack, cord and plug is used, somewhat similar to that employed at large switchboards.

The house sergeant receives the routine or special message and transcribes it immediately upon the typewriter, making three copies, one of which is handed to the lieutenant, captain or officer in charge of the station house for his information and action; the second is returned, at stated intervals, to City Hall for comparison and file, and the third copy is placed on file at the local station house.

Each precinct or district has a telephone and signal circuit which is common to all patrol boxes in that given district. From these patrol boxes, each and every patrolman is required to communicate with his house sergeant at least once every hour, thus making it impossible for any one of them to shirk duty or be off his beat for any length of time unnoticed.

The chief of the Electrical Bureau at Philadelphia, J. T. McLaughlin, has recently placed in service, on trial, a patrol box of his own design, by the use of which, at the desire of the calling patrolman, he may connect himself with the main police board at City Hall, that is, "cut past" the house sergeant. This is especially desirable when a patrolman wishes to give an alarm of fire.

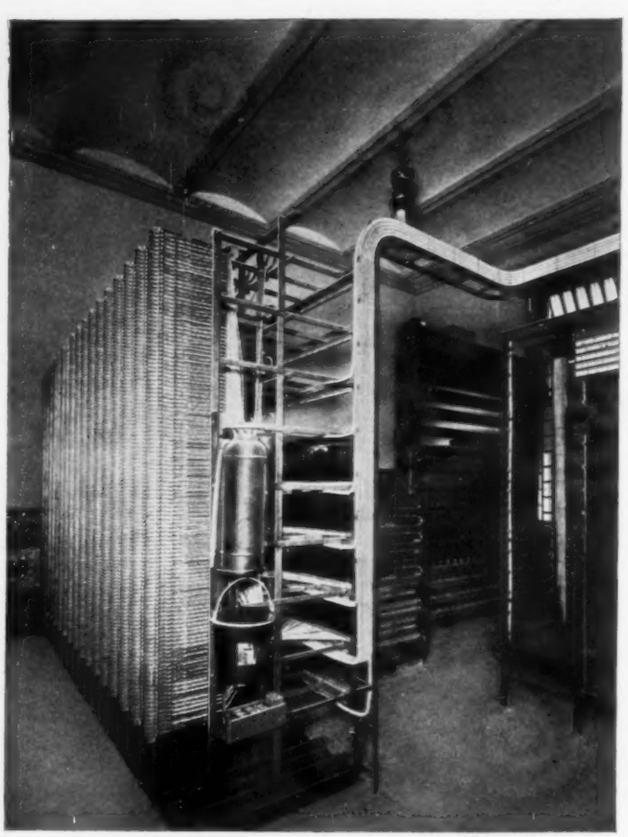
All fire alarms are passed to City Hall before any of the signals in the fire houses are struck.

This special box will also enable the inspector or "plain clothes man," if he so desires, to communicate with headquarters over the head of the officer in charge of the local station.

Another feature of this special box designed by Chief McLaughlin is that the patrolman must "pull" the box before he can telephone. This is to preclude the possibility of the patrolman being off his beat and registering the wrong box.

Two hundred years and more have passed for Philadelphia, and yet men have not greatly changed—they will break the law and cause disturbances. In the onward march of years, however, speech, manner, dress and customs have, indeed, changed; the city has enlarged her borders, opening wide her arms to all comers, and old landmarks have passeed away, making room for the new city, which is yet the Quaker City, cherishing in her heart the traditions of those early days, and which still bears in her quiet streets something of the gentle spirit of the founder.

No longer is heard the "All's well" of the night watch as he pricks his uncertain way through mire and mud; no longer calls the market bell to the defence of the city her sturdy citizens, or to the rescue from fire and danger some unfortunate home and family. A new order of things has come to pass, and while Philadelphia's



Main Distributing Frame.

citizens sleep, vigilant eyes keep watch in many quarters, guarding homes and life and property; and this army of defenders is within instant call to action at all times by means of the city's "nerves."

Not many citizens of today are prone to "count their mercies" when it comes to municipal plessings, but rather find fault, and are wont to rail against those in authority. A study of conditions as we find them will perhaps add to our respect for those who have labored long and late to build up the system which means so much to Philadelphia's welfare and the well-being of her citizens.

Wireless Institute Meeting

The Wireless Institute held a meeting in the Engineering Societies building, New York, November 3. Alfred M. Goldsmith spoke on the subject of "Radio-Telephony," in which he described the characteristic features of all wireless telephone installations which embody means for producing sustained oscillations having a frequency above the audible range and devices for varying the amplitude of the vibrations in accordance with the sounds to be transmitted. He showed that the high frequency oscillations can be produced directly by an alternating-current generator, as by Fessenden, or by a resonating circuit shunted around a direct-current arc, as was done by Duddell when he devised the singing arc. The frequency of the oscillations depends upon the inductance and capacity in the resonating circuit, while the resistance in circuit determines whether the current in the arc will be oscillatory or unidirectional; in order for it to be oscillatory the total resistance in circuit must be of such a nature that an increase in current results in a decrease in voltage at the arc. Better results are obtained when the arc is formed in some gas, such as hydrogen or alcohol. In order to permit a high voltage across the arc, use is made of a magnetic field surrounding the arc.

Use is made of carbon microphones for the transmitter, sometimes with as many as eight in series on 440 volts. Condenser types of transmitters are also used. The receivers are of the telephonic type, such as the De-Forest audion.

Wireless telephony possesses the decided advantage of transmitting speech without distortion independent of distance. The author expressed the opinion that wireless telephony will prove useful for long-distance trunk-line communications as well as for communications between ships.

The next meeting of the Wireless Institute was announced for December 1. A paper is to be presented by W. E. Smith, on "Conversion of Electric Oscillations Into Continuous Current by Means of the Vacuum Valve."

Cities of High Telephonic Development

Grand Rapids, Mich., is one of the most highly developed cities, telephonically speaking, in the United States. It has one telephone in use for every seven and one-half of the population. July 1, 1896, when the Citizens' Telephone Company began operations, the Bell had 1,471 telephones connected. The population of Grand Rapids was then 95,718—one instrument for every sixty-five people.

Today the Michigan State Telephone Company has 4,614 telephones in service and the Citizens' Company something over 10,000, a total of 14,614, serving a population of 110,000.

The Bell rates in 1896 ranged from $50 to $115 per annum for business service, and from $40 to $65 for residence service. The Bell business rate today is $30 a year; the residence rate is $18.

Under dual operation, the number of Bell subscribers has increased 213 per cent, having more than doubled. The Bell business subscriber, who uses that service alone, now pays $52.50 less than formerly, a reduction of 63 per cent; the Bell residence subscriber pays $34.50 less, a reduction of 65 per cent. Both reach more than twice as many people. The rates of the Independent company are $36 a year for business and $24 for residence telephones.

A result of competition which has enhanced the value of the telephone to the business man is the increased use of the service in the homes. Of the Bell company's 1,471 telephones in 1896, about 1,100 were business telephones and the balance, between three and four hundred, were residence instruments. The Citizens' Company has today approximately 5,000 residence telephones.

Joliet, Ill., is another well-telephoned city. A. S. Hibbard of the Chicago Telephone Company says: "We have 110 exchanges in Chicago and 28 outside, 138 in all. Joliet we consider our best exchange. Proportionate to population it has more business telephones than any other locality. We appreciate the patronage given us and on our part are trying to reciprocate by giving the city the best service possible.

"Our inspection here has in every way been satisfactory. We find the service in excellent shape. It is a very large exchange and yet the ratio of complaints is exceedingly small.

"Today the enterprise of cities is measured by the extent and efficiency of their public utilities. Nothing furnishes a better criterion than the number of telephones in use. Joliet in this respect has shown itself one of the most enterprising cities in the state."

Joliet also has a flourishing branch of the Interstate Telephone Company, with headquarters at Aurora.

"Telephone Directory Advertising"

This legend appears in embossed gold letters on the "Alice blue" cover of as beautiful an example of the printer's art as is often seen. The Central Union Telephone Company has used all arts of which modern advertising is capable in preparing its appeal for the use of telephone directory space. Paper, printing and illustrations all show the work of the master hand. If the Central Union can guarantee that its telephone directory advertising pages will be one-half as attractive as its brochure on the subject, it should have no trouble in keeping them filled.

A Correction

Among the short articles in the November number of TELEPHONE ENGINEER appeared one entitled "A Condenser Telephone Receiver." This was translated from the German of *Elektrotechnische Zeitschrift* by a correspondent of the *Electrical Review and Western Electrician*, and should have been credited to that publication.

Recent Telephone Patents

By David S. Hulfish

It will be the purpose of this department to list all United States patents, as they are issued, which pertain to any branch of the telephone business, giving such data in each case as will enable the reader to judge whether he wishes to see the complete drawings and specifications of the patent. When patents of special interest to Telephone Engineer readers are encountered, the descriptive matter herein will be amplified accordingly. A complete copy of drawings, specifications and claims of any patent listed will be furnished from this office upon receipt of ten cents.

933,149. Trunking System. A system of trunking, using a three-wire trunk, from a magneto switchboard, or tollboard, to a two-wire common-battery multiple switchboard. Charles S. Winston, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place.

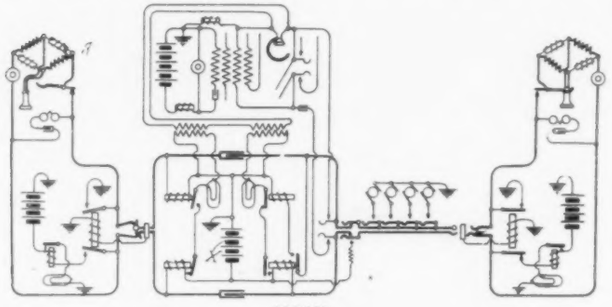
933,150. Telephone System. A three-wire multiple and three way plug is used, with four-relay cord pair, taking the open contact relay of the plug to the third conductor, the circuit extending thence through the cut-off relay to the line circuit. Charles S. Winston, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place.

933,197. Signaling System. A combined fire-alarm, burglar-alarm and telephone system. James G. Nolen, Chicago. Ill., assignor of one-half to Frank B. Cook, of same place.

933,228. Attachment. A mouthpiece attachment comprising two perforated disks, the perforations of which may be made to coincide to open the mouthpiece for use or not to coincide, thus closing the mouthpiece when not in use. The attachment also includes means for holding an antiseptic within the closed mouthpiece. Joseph B. Burkholder, Minneapolis, Minn.

933,277. Attachment. An attachment for holding a memorandum page upon a portable desk telephone. Means is provided for supporting a roll of paper from which the memorandum page is renewed as required. George M. Urie, Kansas City, Mo.

933,335. Supervisory System. This patent shows a modification in supervisory systems which may be adopted as an adjunct to almost any common battery switchboard. The object is to make a recall signal audible as well as visible, thereby securing a greater likelihood of attracting the attention of the operator. Each supervisory lamp is provided with an induction coil, the



933,335.

primary of which is placed in the circuit of the lamp, preferably in series. The secondaries of all of the induction coils are grouped, and the secondary circuit is carried to the head telephone of the operator. The working of any telephone switchhook and consequent flashing of any lamp will cause a series of clicks in the operator's head telephone, thereby advising her of a recall. William S. Paca, Oil City, Pa.

933,404. Audiphone. A set of apparatus for pocket use is shown, and the claims pertain to a specific method for attaching the transmitter and battery conveniently for carrying. Kelley M. Turner, New York, N. Y., and Howell W. Haff, Babylon, N. Y., assignors to General Acoustic Company, of New York, N. Y.

933,720. Submarine Signaling. A device for installation upon a ship for receiving vibrations transmitted through the water and for reproducing those vibrations in an electric circuit by means of a variable resistance button. A casing is provided for holding the carbon button, and a metallic projection is arranged upon the button to project against the ship's side. Josiah B. Millet, Boston, Mass., assignor to Millet Signal Company, of same place.

933,824. Desk Stand. A stand for portable desk telephone in which the switch hook is modified to hold the receiver in position at the ear of the user. Charles S. Coom, Rockledge, Pa.

933,838. Device for Attaching Telephones. A screw-threaded fastener is provided, to screw into the wall, having a head so conformed that the edge of the telephone wall set is gripped. By a quarter turn of the fasteners, the telephone is completely released from the wall. Jonathan B. Horton, Elkin, N. C.

934,255. Distributing Ring. A wall ring having the free end bent to form a guide for the wire to be inserted into the

934,255.

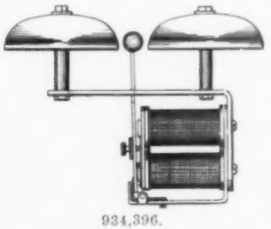
ring. This affords a convenience in pulling the slack out of the wire before it is forced into the ring. John H. Wilson, Rome, Ga.

934,352. Line Wire Connector. A sheet metal tie wire, having hook ends for engaging the line wire and a specially shaped central portion for engaging the insulator. John S. Pratt, U. S. Army.

934,396. Signal Bell. The object is to provide a signal bell which may be installed in restricted spaces. Harold W. Eden, Detroit, Mich., assignor to P. R. Manufacturing Company, of same place.

934,808. Cable Hanger. In a marlin hanger, the bent wire clip is so formed that its free end may be hooked into its marlin eye after the hook is in place upon the suspension wire. William J. Hiss, Jr., New York, assignor to Diamond Expansion Bolt Company, of same place.

934,811. Composite System. Strictly speaking, this is not composite, since the circuit is not available for telephone and telegraph at the same time. The telephone system is metallic circuit, the telegraph relay coils being included directly in the telephone line conductors, but connected differentially, with a minimum reactance; this the inventor secures by shielding the



934,396.

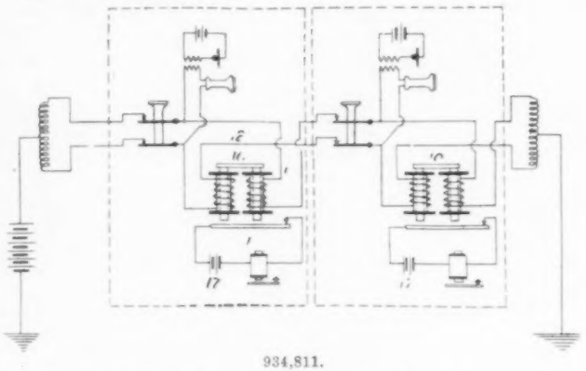
cores ow the magnets with copper tubes. The telegraph circuit is the phantom of the telephone circuit, the telegraph keys being included in both sides of the circuit, breaking both the telegraph and telephone circuits when any key is opened. Winthrop K. Howe, Rochester, New York, assignor to General Railway Signal Company, Gates, N. Y.

934,865. Microphone Deskstand. A device for supporting a microphone, and containing a switch automatically operated by the microphone. Alfred H. Weiss, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place.

934,908. Self-Announcing Signal. A signal is shown which is so designed and so associated with circuits that when the controlling circuit is closed to actuate the signal and the signal is actuated, a telephonic current is returned over the signal circuit to the point of closure, whereby the operator is advised that the signal has been actuated as desired. Edwin R. Gill, Yonkers, N. Y., assignor to the United States Electric Company.

934,977. Drop and Jack. The drop is of the removable-core type, the novel feature of its construction being the pivoted armature held in fixed relation to its reed by a spring which permits the armature to swing out of the way of the core when it is desired to remove the core. Claim 3, which reads as follows, "3. An electro-magnet comprising an iron shell and core, together with a coil removably secured in the shell, and spring locking means for securing the coil in the shell," seems rather broad for the present state of the art. The application was filed June 14, 1905. Ray H. Manson, Elyria, Ohio, assignor to Dean Electric Company, of same place.

934,979. Selective Device. A substation device for selective telephone line has a magnet with two armatures, one of which operates a pawl and ratchet system, and the other of which operates to open the talking and ringing bridge of the substation. The ratchet armature will operate upon a low potential, while the bridge-breaking armature requires a higher potential. A slot in the several ratchets of a line permits selective operation of the bridge-breaking armatures of the line, by sending a high-tension current upon the line, after the ratchets have been set preliminarily by a series of low-tension currents. Frank J. Mersman and Joseph Mersman, Ottawa, Ohio.



934,811.

935,024. Lockout Telephone System. Upon a private line, each station is given the power to lock out the other stations of the line, excluding, of course, the station with which it is desired to converse. William W. Hill, Sumter, Minn.

935,049. Calling Device. A device for a telephone central office switchboard, for enabling station to be called upon step-by-step party lines. Nils E. Norstrom, Chicago, Ill., assignor to the Anderson Electric and Manufacturing Company.

935,105. Party-Line System. A system for private party lines, offering lockout service to lines having many stations and not connecting with a central office. For the purposes of control of selecting devices, a normally open main circuit is provided, with means for closing it from any station. Robert Hamilton, Boston, Mass.

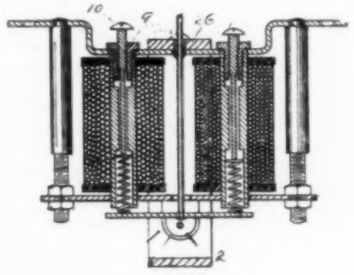
935,150. Automatic Paystation. An electrical switch is provided at the telephone substation for sending a signal, and a lever is provided in a coin chute, an intermediate geared lever being positioned between the coin chute and the switch for operating the switch. Harry W. Hamlin, Milo, Maine.

935,274. Attachment. A mouthpiece with closed front, designed to replace the usual mouthpiece of the telephone transmitter. Friedrich Schilling, Nuremburg, Germany.

935,285. Order-Circuit Device. Much confusion often results in a multi-office manual telephone exchange when a number of A-operators endeavor at the same time to secure the service of a single distant B-operator. The invention of this patent resides in the provision of system and apparatus for permitting but one A-operator to have access to the distant B-operator at any time, thus effectively obviating all confusion. The means provided is a rapidly acting switch of the sunflower type, the searching member of which is connected to the order circuit and the leaves, or fixed members of which are connected to the order keys of the different A-operators who may have occasion to call upon that order wire. The order wire thus is connected in turn to all of the A-operators, but not to any two of them at the same time. Means is provided for holding the connection of the sunflower switch whenever a depressed order key is found, the sunflower switch again operating after the order key is released by the A-operator. Arthur T. M. Thomson, London, England.

935,515. Coin Device. A coin-controlled device adapted to lock a telephone hook except when freed by a coin. Hermann Janke, Halberstadt, Germany.

935,618. Attachment. A distance guard for telephone transmitter mouthpieces. A wide frame is attached to the transmitter funnel to prevent the speaker from placing his lips too close to the mouthpiece, and also to form a gauge by which he will be encouraged to come close enough to the mouthpiece to secure good transmission. Linden H. Webster, Belvidere, N. Y.



935,792.

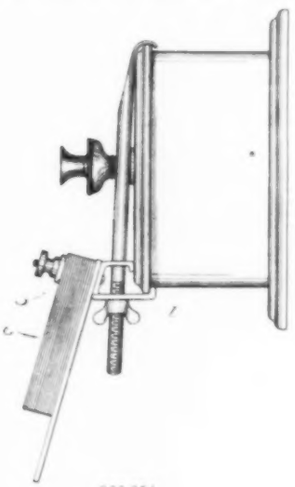
935,792. Ringer. In this improved ringer, Mr. Jensen has found that by applying an adjustable tension means engaging each end of a pivoted armature, variations in power may be overcome, and adjustment may be made against currents of greater or less frequency than that for which the ringer is designed. Nels P. Jensen, Waterloo, Iowa.

935,897. Microphone. A transmitter cell is constructed filled with hydrogen, as a gas surrounding the carbon granules, etc. C. E. Egner, Stockholm, and J. G. Holmstrom, Saltsjostorangen, Sweden.

936,009. Attachment. This telephone desk stand has means for holding the receiver in position for hearing. Evert A. Metcalf, Forbes, Mo.

936,207. Transmitter. A transmitter designed especially for large current values for wireless telephony. A variable resistance is employed whose resistance is subject to change by heat and which manifests great sensitiveness. Clifford D. Babcock, New York, N. Y., assignor to United Wireless Telegraph Company, of same place.

936,254. Attachment. A pad holder with clamping means adapting it to be fastened to the vertical door of a telephone set. It is designed especially for the small compact telephone sets, such as are found in hotel rooms. Newell B. Parsons, Chicago, Ill., assignor to Belden Manufacturing Company, of same place.



936,254.

936,373. Ringing Key. A ringing key of the type having a button for each character of selecting current which

may be sent upon the line. Charles A. Simpson of Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place.

936,374. Trunking System. A single-track two-wire trunk for use between two two-wire common-battery multiple switchboards. Charles A. Simpson, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place.

936,432. Attachment. A receiver supporting device for telephones, attached to the transmitter arm between the arm and the transmitter case. Henry Eccles, Laclede, Mo., assignor to Samuel L. VanAiken, Jr., Syracuse, N. Y.

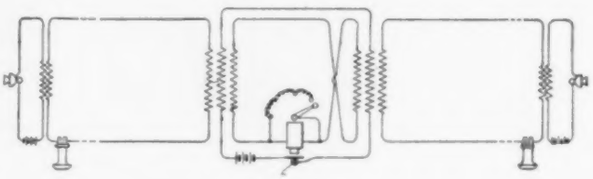
436,495. Telephone System. For local battery, or "magneto" switchboards. Mr. Unger arranges his circuits in such manner than the line drop is tripped by the central office generator when the telephone is taken from the hook, thereby dispensing with the necessity for a substation generator. Similarly, the clearing drop is tripped when the receiver is hung up. Frank C. Unger, St. Louis, Mo.

936,502. Receiver. The receiver is provided with a magnetic regulator, whereby the volume of sound may be controlled. It is desirable for audiphones. Charles E. Williams, Natick, Mass.

937,050. Telephone System. The invention pertains to details of the operator's busy test circuit in connection with a two-way cord pair. Henry P. Clausen, Chicago, Ill., assignor to American Electric Telephone Company, of same place.

937,062. Heat Coil. Specific structural details, covering the insulation and fastening together of the parts. Samuel B. Fowler, La Fayette, Ind., assignor to Sterling Electric Company, of same place.

937,189. Repeating System. The line sections are connected inductively only through two repeating coils, the reinforcing device being associated with windings of the



937,189.

same coils. The object as stated is to provide a repeater suitable for loaded lines. Herbert E. Shreeve, Wyoming, N. J., assignor to American Telephone & Telegraph Company, New York, N. Y.

937,242. Heat Coil. The two separable parts are frictionally held together, and are released by reduction of friction through unequal expansion. Newman H. Holland, Brookline, Mass., assignor to Western Electric Company, Chicago, Ill.

Of Interest to the Trade

A Fire and a Quick Installation

Not all telephone companies can yet enjoy that sense of security that comes with the housing of their equipment in a fire-proof telephone building. In spite of precautions taken, scores of exchanges are burned out every year and there is scarcely a manager in the country who has not worried more or less over this possible interruption to his service with its attendant loss both of revenue and prestige.

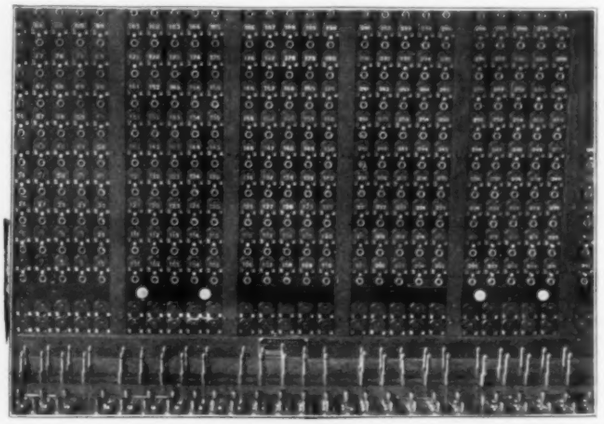
The greatest difficulty looming before the average manager in connection with a possible fire is that of securing a suitable switchboard with any reasonable degree of promptness. However, a record just made by the Kellogg Switchboard and Supply Company in replacing a board destroyed by fire would seem to indicate there is little cause for worry in this respect.

Immediately following the total destruction of its central office by fire the Lamar and Barton County Telephone Company of Lamar, Missouri, placed an order with the Kellogg company for a new 300-line, two-position magneto switchboard, a main frame and No. 10 protector equipment, and a Kellogg pulsating and alternating current pole changer ringing equipment. This order was received at Chicago the afternoon of Thursday, November 11. On Saturday afternoon, November 13, the entire equipment was shipped by express, exactly forty-eight hours after receipt of the order. The express company made delivery of the equipment at Lamar late Sunday evening.

The Kellogg company was promptly advised of the arrival of the equipment, and two of its skilled installers, stationed at Kansas City for just such emergencies, left for Lamar at 2 a. m. Monday morning. Before midnight of the same day the equipment had been completely installed ready for operation by the telephone company.

The building, shipping and complete installation of this equipment in three working days becomes the more remarkable when it is learned that the board was not in stock, but was assembled and wired complete and built to the telephone company's specifications. The board is fitted with the Kellogg company's special double supervisory non-interfering cord circuits throughout. All cord circuits are provided with two ring-off drops and two cord circuit condensers, while ten of them contain in addition four section repeating coils for the proper and efficient connection of grounded and metallic lines.

Each position of the board is provided with master keys for ringing four party selective telephones to ground.



Face of Kellogg Magneto Switchboard.

In this connection a special circuit was provided whereby this selective ringing feature does not require the grounding of the alternating current, and the latter is left free from ground for the proper ringing of metallic toll lines and phantom circuits. Each position of the board is furthermore equipped with line and supervisory pilot lamps, insuring prompt attention to all incoming calls and "disconnects," and notwithstanding the remarkably short time in which the board was shipped and installed.

it is exactly as it would have been with weeks of time to spare both on its construction and installation.

The completeness of the Kellogg company's organization is certainly well brought out, and in having such manufacturing ability to depend on in emergencies the independent operator of today is fortunate.

Telephone Train Dispatching News

The New York, New Haven & Hartford Railroad Company has placed orders for telephone and selector apparatus for equipping the Northampton division for telephone train dispatching. The equipment consists of Gill standard bridging selectors and Western Electric telephone apparatus. This will be the first circuit so equipped on the New Haven road and covers a total of 77 miles, with 29 stations.

From the success attending the installation of telephone train dispatching equipments on the other large roads which have adopted this system of handling train movement, the indications are that after the completion of the first circuit by the New York, New Haven & Hartford Railroad it will extend the system to other divisions of the road.

A system of telephone train dispatching has recently been completed and put into service by the Atchison, Topeka & Santa Fe Railroad Company on its Illinois division between Chillicothe, Ill., and Dearborn street, Chicago, a distance of 134 miles. On this circuit the dispatcher is located at Chillicothe. There are 30 way stations in which telephones and selective equipment have been installed.

With the completion of this circuit the Atchison, Topeka & Santa Fe trains running out of Chicago are handled by the telephone as far as Newton, Kan. A total of 660 miles is covered from Chicago to Newton. There are on this section a total of 170 way stations, all equipped with standard Western Electric telephone train dispatching apparatus and Gill bridging selectors. Each of these stations has direct communication over the telephone with the dispatcher of its division.

The New York, Chicago & St. Louis Railroad Company is planning a telephone train dispatching equipment for its line from Conneaut to Bellevue. This circuit will be the first one installed by the New York, Chicago & St. Louis, and if it proves satisfactory the railway company will in all probability equip its entire line with telephone train dispatching apparatus.

The total length of the line is 132 miles and there will be 28 regular station equipments, with a number of special siding telephones, so located that the train crews can get in direct communication with the dispatcher. The equipment used will consist of the standard Westtern Electric telephone train dispatching apparatus and Gill selectors. The siding telephones will be mounted in telephone booths, which will offer shelter for the train crews when reporting to the dispatcher, or receiving orders from him. Arrangements are made so that the telephone sets at these sidings are automatically cut free from the line when the telephone sets are not in use.

The telephone train dispatching apparatus which has been installed on the large railroad systems throughout the country has been giving such satisfactory service that there is little doubt that the equipment installed by the "Nickel Plate" will result in the system being installed over the entire line of the New York, Chicago & St. Louis Railway.

The Atlantic Coast Line has in process of construction, and will shortly cut into service, a telephone train dispatching circuit from Richmond, Va., to South Rocky Mount, N. C., a distance of 121 miles. The dispatcher for this circuit will be located at Richmond. There will be 32 selector way stations and two local telephone stations in the chief dispatcher's office and the superintendent's office at Richmond. These stations will be called by means of a buzzer.

The transmission line is constructed of No. 9 B. & S. copper, 210 pounds per mile. Western Electric telephone apparatus and Gill selectors are used throughout.

The rapidity with which the telephone is being adopted for train dispatching in some parts of the south emphasizes the progressive spirit with which the railroads of that section are meeting their problems today. The Western Electric Company reports that within the past six weeks three other railroads have placed orders for telephone train dispatching circuits leading out of Richmond. These are the Chesapeake & Ohio, Richmond, Fredericksburg & Potomac and the Seaboard Air Line.

A New Book

A COURSE IN PRACTICAL ELECTRICITY, in twelve lessons, for home study, is another of the new text books by Joseph G. Branch. Lesson 1 explains all that is essential as to the nature and phenomena of static electricity, while Lesson 2 covers the elements of dynamic electricity in a remarkably thorough manner, considering its brevity. Mr. Branch has a peculiar talent for explaining abstruse and technical subjects in the simplest possible language and in a style which is far from "dry." For the student or workman who has little time or inclination to delve into the difficult subject of electricity as it is ordinarily presented, the Branch series will prove invaluable. They are well within the comprehension of those whose general education is slight, and afford an open door into science for the layman.

Published by the Branch Publishing Company, Chicago. Price, 50 cents boards, 75 cents cloth covers.

The Technical Publicity Association

The Technical Publicity Association held its second fall meeting on Thursday evening, November 11, at the National Arts Club, 14 Gramercy Park, New York. There was an unusually large attendance at the informal dinner, which was followed by an interesting program. The feature of the evening was a spirited debate on the merits of special issues of technical and trade papers. Arguments were supplied by several men of national reputation in the technical advertising field.

A novelty was the vote taken by the members of the association at the close of the debate. All were asked to confine their balloting strictly to the merits of the arguments as presented. When the vote was counted it showed that twenty-five were opposed to special issues of trade journals and ten in favor. One man voted "Yes, for real issues."

The argument was opened by James H. McGraw, president of the McGraw Publishing Company, who spoke for the affirmative. He declared that he believes in the special issue to a certain extent, but it must have three features to make it of extra value to the advertiser. In the first place, said Mr. McGraw, it must have a legitimate reason for its publication. The editorial

matter must be distinctive, and the extra circulation promised must be honestly given.

"When these three are present," said the speaker, "it is unquestionably a good advertising medium."

J. George Frederick, managing editor of "Printer's Ink," spoke earnestly in favor of special issues, but with certain limitations. He cited an instance where the diversity of interests in a particular field required special issues so that the editors might concentrate in separate numbers matters which could not well be presented otherwise. The abuses of the special issue he declared to be the exaggerated value to advertisers as represented by certain publishers. He did not think special issues of very much greater value than the regular issues, but declared that there was a medium between the two extremes. "A quiet editorial policy of concentration," he said, "makes a paper more valuable."

L. F. Hamilton of the National Tube Company gave the point of view of a member of the T. P. A. He declared that in his personal experience, special issues had been considered merely on their merits as regular editions at the time they were published.

The Technical Publicity Association elected a number of new members at the meeting. In the absence of President Redfield, Mr. O. C. Harn, advertising manager of the National Lead Company, was toastmaster. Mr. Howard M. Post, chairman of the Publicity Committee, reported very satisfactory progress. He presented a portfolio of technical and trade paper comments showing graphically the increasing recognition of the T. P. A. as a factor in the technical advertising field. The association, at the close of a very profitable evening, adjourned to meet again Thursday, December 8.

Johann & Johann Busy

H. A. Johann, of Johann & Johann, has just finished making new cables out of some very bad old ones for the Dalhart Telephone Company, Dalhart, Texas. In the old cables 80 pairs out of 100 were bad. It was necessary to make 71 cuts in the cables to find the bad ones. With two helpers H. A. put the cables in working order in four and one-half days.

O. R. Johann, at Minneapolis, has closed a deal with the telephone company at International Falls, Minn., for some extensive rebuilding. H. A. says there is lots of work in sight through the Panhandle country.

New Kellogg Board for Crawford, Neb.

L. R. Foote, the Nebraska representative for the Kellogg Switchboard & Supply Company, reports the closing of a contract for a common battery multiple switchboard and telephones for the Crawford Telephone Company, Crawford, Neb.

This board will be in the Kellogg company's latest type 3,000 line section, and while the present equipment is only for 300 common battery lines and 20 rural and toll lines, the telephone company expects to be operating many times this number of telephones within the coming year.

The line construction in connection with this plant is far in advance of most towns of its size, and the major portion of the lines are being distributed through cable.

This company has looked far enough ahead to realize that the success of its undertaking depends in a very large measure upon the ease with which it can come into contact with neighboring towns and distant cities. Toll lines in service and under construction connect or will connect Crawford with all of the principal cities of the middle west.

Like many telephone companies in the western states, the Crawford Telephone Company is purchasing the best equipment for both inside and outside plants.

Gift to the A. I. E. E. Library

A most valuable addition to the library of the American Institute of Electrical Engineers has been made by the Western Electric Company. The gift is a patent specification library, and is the largest and most valuable accession since the gift of the Latimer Clark collection, by Dr. Schuyler Skaats Wheeler.

The library just acquired consists of 461 leather-bound volumes, containing approximately 100,000 specifications. These specifications date back to May 30, 1871, and cover the entire period to December, 1908. They embody the telephone, the electric light, electric railways, and the electric motor. From May 30, 1871, up to and including the year 1887, the volumes are complete, and contain all the specifications certified, issued by the United States patent department. From July, 1887, to December 1, 1908, the volumes contain all the electrical specifications which are not certified.

The cost of the original set was over $4,000 and duplicates of the specifications, if now purchased from the government, would cost between $4,000 and $4,500. The collection has been accumulated by the Western Electric Company in Chicago.

New Kellogg Bulletins

The Kellogg Switchboard & Supply Company has recently issued a new bulletin (No. 49) on toll test panels, which are a great convenience, as well as a necessity in the operation of an up-to-date toll equipment in connection with a city local exchange. In this bulletin the uses of the different types are fuly explained and illustrated, and a detailed description of the construction is given.

A still more recent bulletin (No. 51) covers the subject of arresters. The different uses for arresters are fully explained, and illustrations, accompanied by detailed descriptions, are plentifully scattered through the bulletin. Code numbers are arranged for the different types to facilitate ordering. Brief directions for installing and connecting the arresters, illustrated by diagrams, are also contained in this bulletin.

Telephones Wanted in China

An American consul in the Far East reports that a local newspaper has published a notice of the intention to start a telephone company in a city of his district. The steady increase in trade and the lively traffic with neighboring cities are given as the reasons for the contemplated undertaking. Upon repeated petitions the governor has considered the proposition and permission has been granted for the installation of the system. The address to which correspondence regarding this matter should be addressed is Taotai Hsin tsching pang, Shantung, Provincial Government Offices, Tsinan, Shantung, China.

Brevities of the Business

PERSONAL NOTES.

George F. Durant, who died recently, installed the first telephone exchange in St. Louis, and had been general manager of the Bell Telephone Company of Missouri since its organization by him, in 1878.

Francis Dagger has been appointed secretary of the Canadian Independent Telephone Association and will devote his entire time to the organization and development of the independent telephone system in Canada. The association is to be congratulated on being able to secure a man of Mr. Dagger's experience and ability.

Capt. John M. Baer has been elected president of the Fox River Valley Telephone & Telegraph Company, Appleton, Wis., to succeed the late John S. Van Nortwick, who had been president of the company since its organization.

G. Freeman has been appointed manager of the Pilger Telephone Company, Pilger, Neb., to succeed C. E. Montgomery, resigned.

John W. Latham, formerly in the engineering department of the Chicago Telephone Company, has been appointed traveling inspector for the Southern Bell Telephone Company, with headquarters at Atlanta, Ga.

L. W. Fielding, formerly connected with the Home Telephone Company, Jonesboro, Ark., has accepted a position with the Automatic Electric Company, Chicago.

B. E. Eoff has been appointed manager of the Warsaw Telephone Company, Warsaw, Mo.

E. H. Lamar has been appointed manager of the Alamo Home Telephone Company, Alamo, Tenn.

Fred L. Baer has assumed the position of assistant traffic superintendent with the Home Telephone Company, San Francisco, Cal.

M. J. Coffey has been appointed assistant wire chief for the Postal Telegraph Company, at Cincinnati.

Fred Noyes has been elected manager of the Maine Telephone Company, Livermore Falls, Me.

A. A. Wicks, former chief clerk of the Ohio and Mississippi Valley Telephone Company, Murphysboro, Ill., has been appointed general manager of the company.

NEW TELEPHONE COMPANIES.

JONESBORO, ARK.—The Rural Telephone Company of Jonesboro has been organized by the farmers in this vicinity, with D. S. W. Moorland president and W. I. Lindley secretary.

MOSCOW, ARK.—The Moscow & Youngstown Telephone Company has been organized, with the following officers: President, P. C. Galloway; vice-president, J. T. Conrad; secretary-treasurer and manager, Ed Young.

LA JARA, COLO.—The La Jara Telephone Company has been incorporated, with a capital stock of $3,000, by Daniel E. Newcomb, Calvin L. Smith and William A. Braiden.

ARCO, IDAHO.—The Arco Telephone Company has been organized with a capital stock of $1,500. The officers are as follows: President and manager, John W. Fowler; secretary and treasurer, W. G. Sweet; vice-president, Otto B. Fischer; directors, the above officers and I. H. Smith and M. A. Dillingham.

OKAWVILLE, ILL.—The Okawville & Southern Telephone Company has been incorporated by Herman Brockmeier, William Growe and William Randall; capital stock, $2,000.

CARBON CLIFF, ILL.—Clark Corbin, Sharp Silvis and Ed Wells are the promoters of the Carbon Cliff Telephone Company, recently organized in this place.

TENNYSON, IND.—Articles of incorporation have been filed for the Tennyson Mutual Telephone Company; capital stock, $20,000. The incorporators are W. O. Hendrickson, Charles Pango, C. R. Stephens, F. A. Rhodes and Forren Hobbs.

TEEGARDEN, IND.—The Marshall & St. Joseph County Mutual Telephone Company has been incorporated with a capital stock of $1,000. The officers of the company are as follows: President, C. F. Ruple; secretary, J. B. Davis.

STANHOPE, IA.—A charter has been granted the Stanhope & Northwestern Telephone Company. The incorporators are H. M. Lucas, L. O. Dick, I. Dick, John Reilly, S. J. Cottingham, J. H. McFarland, A. F. Elkins and Robert Fisher.

PLEASANT HILL, IA.—The Pleasant Hill Telephone Company has been incorporated; capital stock, $10,000. The officers are as follows: President, Grant McCowan; vice-president, F. M. Brown; secretary, J. S. Wilcox; treasurer, Henry Siewertsen.

CRYSTAL LAKE, IA.—The Britt & Crystal Farmers' Telephone Company has been organized by A. O. Christenson, P. G. Anderson, M. J. Barrett, Edward Peterson, J. M. Coller and David Frazer; capital stock, $6,000.

IMOGENE, IA.—A telephone company has been organized with the following officers: President, Dr. Allen; secretary, M. M. Holbert.

HAYWOOD, KY.—The Haywood Home Telephone Company has been incorporated by George M. Ellis, S. A. Hawley and George W. Drane, with a capital stock of $500.

PRESTONBURG, KY.—The Floyd County Telephone Company was recently organized in this place with a capital stock of $3,000, by F. S. Harkins and others.

HYDEN, KY.—The Hyden-London Telephone Company has been organized with W. I. Ford manager; capital stock, $3,000.

CHAVIES, KY.—The Chavies Telephone Company is the name of a new organization recently formed by Calvin Hall, manager; Sam Patton and William Combs, Sr.; capital stock, $1,000.

PULLMAN, MICH.—The Adamsville Telephone Union has been incorporated with a capital stock of $10,000.

MARENISCO, MICH.—Articles of incorporation have been filed with the secretary of state for the Marenisco Telephone Company.

MARQUETTE, MICH.—The Chocolay Telephone Company has been organized.

VERGAS, MINN.—Articles of incorporation have been filed for the Vergas Telephone Company by W. B. Carman, James Mesbitt and A. C. Schwarzrock; capital stock, $10,000.

FREEBORN, MINN.—Fred Feine, A. E. Gilmore and J. B. Purdue are the incorporators of the Freeborn Telephone Exchange; capital stock, $5,000.

SPRINGFIELD, MINN.—The Redwood County Long Distance Telephone Company has been organized with a capital stock of $10,000, and the officers are as follows: President, A. O. Gimmestad; vice-president, A. D. Stewart; secretary, George L. Evans; treasurer, L. Lindeman.

TINTAH, MINN.—The Tintah Telephone Company has been incorporated by G. W. Mace, J. R. Davidson, M. E. Doleman, J. P. Dahlquist and others.

REDSTONE, MICH.—The Redstone Telephone Company was organized recently. M. E. Pruyne of Alma, Mich., is one of the chief promoters.

ST. JOSEPH, MO.—The St. Joseph Long Distance Telephone Company has been incorporated with a capital stock of $1,250,000, $1,125,000 of which is preferred and $125,000 common stock. Among those interested are the following: Theodore Gary, Macon; W. S. Dickey, Kansas City; W. R. Rankin, Tarkio; G. H. Davis, Kansas City; R. W. Freay, St. Joseph.

DREWSY, ORE.—The Drewsy Telephone Company has been incorporated with a capital stock of $3,000. The incorporators are S. S. Williams, J. L. Litz, John Ott, W. D. Baker and Geo. L. Baker.

OREGON CITY, ORE.—The Central Point Telephone Company has been incorporated by G. S. Randall, Jacob Rettinger and G. G. Randall.

MART, TEXAS—The Limestone Telephone Company has been incorporated with a capital stock of $4,500, and the incorporators are Richard Blackwood, H. F. King and F. B. Moore.

PHILLIPSBURG, TEXAS—The Phillipsburg Telephone Company has been incorporated by John Stein, C. F. Meyer and C. C. Theil; capital stock, $1,000.

DURANGO, TEXAS—The Durango Telephone Company has been incorporated by J. H. Cox, G. L. Farmer and T. C. Farmer.

HUME, VA.—The Morven Telephone Company has been incorporated with the following officers: President, James R. Green, Markham; secretary and treasurer, E. Marshall Newton; directors, C. H. Corder, Edward Ambler, C. J. Yates, all of Hume; capital stock, $3,000.

BURLINGTON, VT.—The Heath Telephone Company, incorporated under the laws of Massachusetts, has filed articles of incorporation to do business in this state. The capital stock is $7,000, and Charles S. Goodrow, of Readsboro, is the Vermont representative.

QUINCY, WASH.—The Grant County Telephone Company has been incorporated; capital stock, $6,000. The incorporators are E. O. Yeldell, E. L. Hoffman, A. Keigley, I. Chafee, A. R. Smith, W. H. Virginia and J. B. Morrison.

OKANAGAN, WASH.—The Okanagan Telephone & Telegraph Company has been incorporated by C. E. Hansen, Harry J. Kerr, Ira Freer, F. H. Owen and Chris Pain.

Helena, Mont.—Articles of incorporation have been filed for the Meagher-Fergus Telephone Company with a capital stock of $40,000.

Butte, Mont.—The Interstate Consolidated Telephone Company has been incorporated with a capital stock of $5,000,000. The incorporators are Irwin Whitehouse, Herbert E. Risley, Bernard Cooper, Jr., Fred G. Lewis, Thomas B. Conrad, Walter T. Bleick and T. S. Lane.

Plainview, Neb.—The Crawford Valley Telephone Company has been incorporated for the purpose of operating in Pierce and Antelope counties. C. E. North is president of the company and N. M. Somerville secretary.

Reno, Nev.—The Bannock Telephone & Telegraph Company has been organized by local parties.

New York, N. Y.—The Central Wireless Company has been incorporated with the following directors: James R. McLean, Hotel Latham; Orley C. Granger, 49 Exchange place, and Richard E. Nebel, 274 Ryerson street, New York. The purpose of the company is to manufacture or deal in telephone and telegraph devices.

Truxton, N. Y.—The Truxton & Chening Telephone Company has been incorporated with a capital stock of $2,000, by A. Risley Muller, William Bell and W. R. Bennett, all of Truxton.

Cattaraugus, N. Y.—Articles of incorporation have been filed for the Cattaraugus Union Telephone Company, with a capital stock of $50,000. The directors are as follows: John W. Morrison, Fred O. Goodwin, Fletcher W. Pike and George R. Fuller, of Rochester.

Belfast, N. Y.—The Allegany Telephone Company has been incorporated with the following directors: Robert E. Lang, George J. Fick and John B. White, all of Belfast; capital stock, $10,000.

Walton, N. Y.—Articles of incorporation have been filed for the Citizens' Home Telephone Company; capital stock, $100,000. The directors are as follows: George O. Mead, Walton; Theodore M. Brush and Irving H. Griswold, Elyria, Ohio; Irving R. Goughley and George H. Rymers, Albany.

Atkinson, N. C.—Articles of incorporation have been filed for the Pender Telephone Company by Dr. J. T. Haggard, E. E. Murphy, E. A. Hawes, Jr., and others; capital stock, $10,000.

Nashville, N. C.—The Nashville & Castalia Telephone Company has been organized by S. J. Austin and S. J. Bartholomew.

Vermilion, Ohio—The Farmers' Telephone Company has been incorporated by George W. Shattuck and others; capital stock, $10,000.

Tiffin, Ohio—The Tiffin Consolidated Telephone Company has been incorporated with a capital stock of $100,000. The incorporators are Lewis Selle, Jacob J. Fleck, Hiram W. Yeager, Wm. H. Kildow, A. A. Cunningham and I. C. Roger.

Buffalo, Okla.—The Buffalo Rural Telephone Company has been organized with the following directors: J. W. Meyers, Dobey Springs; John Houser, Robert Price, R. C. Bailey and Alfred Delkel, Buffalo.

Sedan, Okla.—The Saddle Mountain Mutual Telephone Company has been organized by Amos Thompson and A. B. Meiner of Sedan, and C. E. Evatt, of Saddle Mountain; capital stock, $875.

Gerry, Okla.—The Gerry Telephone Company has been organized; capital stock, $9,000. The directors are Horace Pureman, Ernst R. Truman and D. T. Pinkerton.

Grady, Okla.—The Grady Telephone Company has been incorporated with a capital stock of $1,000. The incorporators are M. B. Grayson, of Oscar; J. W. Dunford and A. G. Cranfield, of Grady.

Checotah, Okla.—The Checotah-Tekana Telephone Company has been incorporated by J. E. Wise, E. H. Cross and M. M. Cross; capital stock, $4,000.

Harbor, Ore.—The Checto Southern Telephone Company has been incorporated with principal office at this place. The capital stock is $5,000, and the incorporators are W. J. Cooley, A. G. Gradiner and Erasmus G. Gradiner.

Charleston, W. Va.—The Consolidated Telephone & Telegraph Company of New York has been incorporated in this city for the purpose of operating telephone lines in the United States and Canada; capital stock, $25,000. S. N. Noyes, J. M. Ritz, A. B. Woodruff, I. H. Klieves and Edgar Charnock, all of Wheeling, are the incorporators.

Keyser, W. Va.—The Mineral County Mutual Telephone Company was recently incorporated by O. A. Hood and others, with a capital stock of $5,000.

Kaukauna, Wis.—The Kaukauna Telephone Company has been organized.

Sturgeon Bay, Wis.—A new company, to be known as the Washington Island Telephone Company, has been organized, with John Goesselson as president.

Thomasville, Wis.—The Thomasville Rural Telephone Company has been incorporated with the following officers: President, David Strack; secretary, E. H. Neiman; treasurer, George Lauer; directors, Jacob Hoke and G. D. Moul.

Valdez, Alaska—The Valdez-Fairbanks Long Distance Telephone Company has been organized.

Glen Ewen, Sask., Can.—The Glen Ewen Rural Telephone Company was recently incorporated.

Butte, Mont.—Articles of incorporation have been filed for the Montana Independent Telephone Company, with a capital stock of $1,500,000. The directors are H. A. Gallway, Charles J. Kelly, Thaddeus J. Lane and Herbert S. Brown.

FINANCIAL ITEMS.

Pekin, Ill.—The Farmers' Mutual Telephone Company will increase its capital stock to meet the demands of its rapidly-increasing business. The company now has about 1,000 telephones in operation.

Robinson, Ill.—The Southeastern Illinois Long Distance Telephone & Telegraph Company has filed an amendment increasing its capital stock from $30,000 to $50,000.

Pomeroy, Iowa.—The stock of the Pomeroy-Palmer Mutual Telephone Company has been increased from $10,000 to $20,000.

Jansen, Neb.—The Farmers' Co-operative Telephone Company has been granted permission to increase its capital stock to $10,500.

York, Neb.—The York County Telephone Company will increase its capital stock to $50,000, and will place $25,000 worth of stock on the market.

Willshire, Ohio—The Willshire Telephone Company has increased its capital stock from $20,000 to $50,000.

FRANCHISES ASKED AND GRANTED.

Carbon Cliff, Ill.—The Carbon Cliff Mutual Telephone Company, recently incorporated, has applied for a 25-year franchise.

McPherson, Kans.—The city council has granted the McPherson Telephone Company a 20-year franchise to construct and operate a telephone system.

Cornettsville, Ky.—The Perry County Telephone Company is seeking a franchise to construct a telephone line from this place to Danks, Ky. A. A. Cornett, Cornettsville, is interested in the project.

Grosse Pointe Village, Mich.—The Home Telephone Company of Detroit has been granted permission to construct and operate telephone lines in this place.

Kerkhoven, Minn.—The Kerkhoven Telephone Company has been granted a franchise to operate in this place.

Newport, Ohio—The Citizens' Telephone Company has been granted permission to construct and operate a telephone system in this place.

Rock Falls, Ill.—A twelve-year franchise has been granted by the city council to the Central Union Telephone Company. Service rates are to remain the same as under the expired franchise.

Paragould, Ark.—The Independent Rural Telephone Company of Marmaduke has asked for a new franchise, which will enable it to install a switchboard in this city.

Medford, Ore.—E. C. Sharpe, of Oakland, Cal., has been granted a franchise, work to begin within four months.

Baxter, Tenn.—The Home Telephone Company has been granted a franchise to operate in Cookeville, where it will install a large exchange and will use that place as its principal office.

Luray, Va.—The Mutual Telephone Company of Page county has been granted permission to enter the city limits.

Colville, Wash.—The Northport & Deep Creek Telephone Company has been granted a franchise by the county commissioners.

MISCELLANEOUS.

Phoenix, Ariz.—The Home Telephone Company will install an automatic telephone system in Phoenix.

San Diego, Cal.—The Home Telephone Company contemplates the expenditure of about $40,000 in improvements, under the supervision of Manager R. E. Thompson.

Aurora, Ill.—The Interstate Telephone and Telegraph Company has decided to expend $5,000,000 on its system throughout the state, at the rate of about $1,000,000 a year.

Champaign, Ill.—The Home Telephone Company will spend from $10,000 to $12,000 in the improving and extending of its system in this city and Urbana, in order to meet the demands of its increased business.

ROCKSBURY, MINN.—The Farmers' Mutual Telephone Company will extend its lines.

SCRANTON, KAN.—The local telephone system has been purchased by Henry Isaacs.

PORTLAND, MAINE.—The New England Telephone and Telegraph Company has purchased the Northeastern Telephone Company.

PARK RAPIDS, MINN.—An election will be held to vote upon the question of issuing bonds for the construction of a municipal telephone exchange.

MEADVILLE, MO.—The Meadville telephone exchange, owned by H. M. Patterson, has been sold to Barnes & Pratt, of Bucklin and Brookfield.

STOUTSVILLE, MO.—The Independent telephone exchange, owned by S. T. Pollard, has been sold to W. M. McCoy of Chicago.

DOWNING, MO.—The Downing Telephone Company will rebuild its lines.

CHARLESTON, MO.—The Southeast Missouri Telephone Company intends to rebuild the exchange at Kennett, Mo.

DETROIT, MICH.—The Michigan State Telephone Company has purchased the property of the Northeastern Telephone and Telegraph Company.

COLUMBIA, MO.—Work will soon begin on the new Independent telephone plant. An underground cable system will be placed in the business district. J. A. Hudson is the owner of the system.

MOREHOUSE, MO.—The exchange of the Southeast Missouri Telephone Company was destroyed by a recent fire.

DODSON, MONT.—Robert Moore will construct a telephone line to Harlem in the spring.

POWELL, NEB.—The Powell Telephone Company has been sold to the Fairbury Telephone Company.

CINCINNATI, OHIO.—The Cincinnati and Suburban Bell Telephone Company will build a new branch exchange.

CARLSBAD, N. M.—The Public Utilities Company is erecting a concrete exchange and a new switchboard will be installed.

SANTA FE, N. M.—The Santa Fe Electric Telephone Company announces that work will soon begin on the construction of toll lines to Espanola and Lamy.

WICHITA FALLS, TEX.—The Southwestern Telephone and Telegraph Company will expend $30,000 in installing a new system here. A new switchboard will be installed at Brenham.

OMAHA, NEB.—The Independent Telephone Company will make many improvements here soon.

CHESTER, N. Y.—The Chester Telephone Company will make many improvements.

CARTHAGE, N. C.—The Carthage Telephone Company is planning the construction of telephone lines to Bensalem, Eagle Springs and Biscoe.

MARS HILL, N. C.—The North Buncombe Telephone Company will install a telephone exchange here.

MILWAUKEE, WIS.—The Wisconsin Telephone Company has purchased the Douglas County Telephone Company.

BEACH, N. D.—The Golden Valley Telephone Company will construct a system here.

CYRIL, OKLA.—W. A. Wright has purchased the stock of the Cyril Telephone Company.

RYAN, OKLA.—The city will vote on a bond issue for installing a municipal telephone system.

BELLE FOURCHE, S. D.—The Northwestern Land Company will construct about 75 miles of lines in Butte county.

HUDSON, WIS.—The Northwestern Telephone Exchange Company has sold its holdings to the Wisconsin Telephone Company.

COMMERCE, TEX.—The Commerce Telephone Company has been purchased by J. W. Shipman.

OAKVILLE, TEX.—A. J. Moore, San Antonio, has bought the rural telephone system formerly belonging to E. J. Atchley.

BRIGHAM, UTAH.—A bond issue is being planned by the city for a municipal telephone system.

WAYSIDE, WIS.—The Wayside Telephone Company will soon build an extension through Maple Grove.

CUMBERLAND, WIS.—The McKinley Telephone Company will erect an exchange building and make extensions to its lines.

MILWAUKEE, WIS.—The Wisconsin Telephone Company will expend $50,000 to install a new exchange here, and $10,000 in improving Berlin.

BRISTOL, WIS.—The Bristol Telephone Company will erect an exchange building and make extensions to its lines.

BAGGS, WYO.—E. M. Tierney is interested in a new telephone line between Baggs and Wamsutter.

EDMONTON, ALB., CAN.—The city council will install a telephone fire alarm system.

CRANBROOK, B. C. CAN.—The Kootenay Telephones, Ltd., will construct lines through the country to the north of Spokane.

BELLA COOLA, B. C., CAN.—B. F. Jacobson is interested in the construction of a local telephone company.

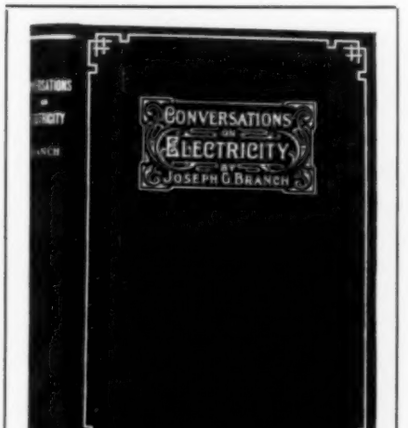
WINNIPEG, MAN., CAN.—The Manitoba Telephone Commission has prepared a list of supplies required when a number of extensions to the government system will be made.

Frontier Company's New Project

The officers and directors of the Frontier Telephone Company, of Buffalo, have incorporated a company to be operated in connection with the telephone system known as the Still Alarm Company. The object of this concern is to furnish fire, burglar and watch service to the business houses, factories and residences in the city. A system has been perfected whereby any irregularity on the part of a watchman of a factory to register his rounds will be signaled to the office of the alarm company and a man will be sent to investigate immediately. In residences the alarm will be fixed so that any attempt by burglars to enter the house will be recorded at the alarm company's offices and men will be dispatched to the house promptly. Fire signals will be operated in a similar manner.

Conversations on Electricity

By JOSEPH G. BRANCH, B. S., M. E.



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Three position multiple type switchboard.
Ultimate capacity, 3000 lines.
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Present equipment of toll board, 20 toll lines.

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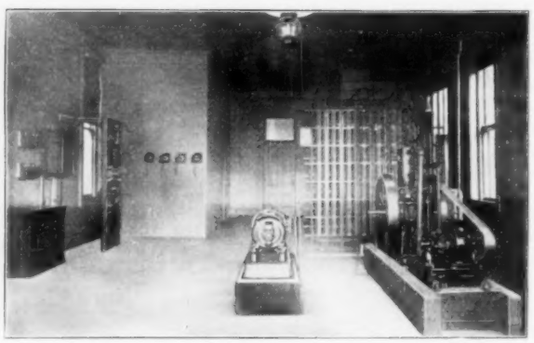
Three position multiple type switchboard.
Ultimate capacity, 3000 lines.
Fifty rural and 40 toll lines installed additional.
Latest type chief operator, wire chief, and toll desks.



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Slate power switchboard, harmonic pole changers, motor generator, charging set, storage battery equipment charging generator and engine.

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Their Worth By The Service They Give

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These two desks were photographed in service in the exchange rooms. Their successful operation proves they were designed and built by "men who know." They combine attractive appearance, convenient arrangement and practical operating—qualities that make them unsurpassed.

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Wire chief's desk completely equipped with lines and testing trunks to local switchboard; also lines to chief operator's desk and toll board and testing trunk to main frame.

The main intermediate distributing frame and relay rack are of latest type and design.

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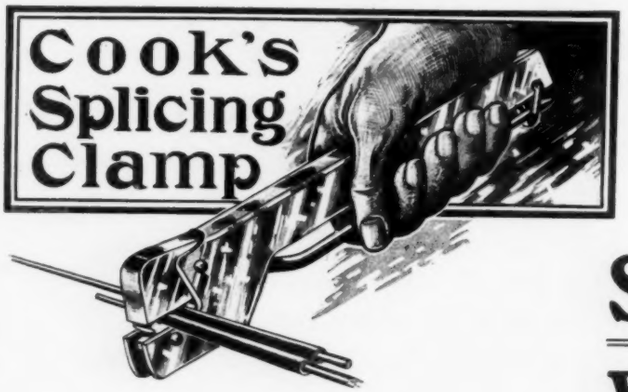

is the latest improved tool for making wire splices. It is equally efficient for sleeve or bare wire joints. It is operated like an ordinary plier and is fully guaranteed against defective material or workmanship. This Clamp is absolutely rigid when clamped on the wire or joint. No slipping with this tool. It makes a perfect Western Union splice and does not injure the coating on galvanized iron wire.

Cook's Clamp is made in two sizes, 10 in. and 13 in., furnishing a range covering sleeves from No. 4 to No. 18 and bare wire from No. 0 to No. 14. Each tool accommodates six sizes of sleeve or wire. It has been thoroughly tested by experienced telephone and telegraph men and has received their unqualified endorsement. We cheerfully grant any responsible party the privilege of examination and test. You may return the tool if not satisfied.

SELF-WELDING WIRE JOINTS

In the Cook Joint the mere act of twisting draws the sleeve into the recess, between the wires, stretching it absolutely tight around both wires, making a perfect self-weld.

A joint made with the COOK SELF-WELDING JOINT is stronger than the wire itself.

When a twisted joint is cut in two it is impossible to see where the metal in the joints ends and the wire begins.

Moisture or air cannot penetrate and corrode the wire and the joint. The Cook Self-Welding Wire Joint insures a permanently perfect connection.

WIRE JOINT COMPARISON

A—Cook No. 10 with one No. 10 and one No. 12 Wire.
B and C—Competitor No. 10 Joint with one No. 10 and one No. 12 Wire.

The Cook Joint will give perfect results as a combination joint, when the wires used are not more than two gauges apart.

No. 0000 to No. 18 IRON OR COPPER

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The Western Electric Company has developed the dry cell telephone service to its highest stage of perfection in the Improved Blue Bell Battery illustrated herewith. This battery has the longest life and highest efficiency for local and long distance telephone service. Competitive tests show it to be superior to any other dry battery on the market.

The long life of the Improved Blue Bell Battery means lower maintenance expense, and lower maintenance expense means arger dividends Consider these points before placing your next order.

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Dry batteries must be *fresh* to be most efficient and to ensure our customers being provided with fresh batteries, the date of manufacture is stamped on each one.

We recommend our **No. 1—A Battery Box** as a suitable case in which to mount the batteries used with desk stands and small telephone sets. This box is designed to hold three standard dry cells and consists of a black enameled steel case with an insulating lining of pressboard Holes for the entrance of the battery wires are provided in the cover and bottom of the box.

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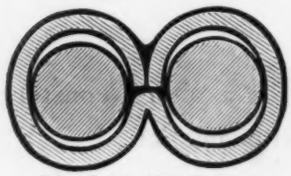
DECREASE THE BORE

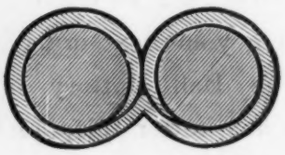
of the sleeve by twisting and you have a perfect joint. Illustrate this fact for yourself. Twist a paper roll between your fingers and watch the inner edge of the paper creep around inside and decrease the diameter of the bore--If you had a wire inside it would be gripped tightly along its entire length. That's the Harvard secret. Our joints when twisted grip the wire equally along its entire length and become practically a part of it.

Other Joints Before Twisting.

Harvard Joints Before Twisting.



Other Joints After Twisting.



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With the square edges on *other joints* butted up against the back wall of the middle segment, they have no place to go when twisted, and while you change the shape of the bore, you do not change its size. The result is air spaces and corrosion.

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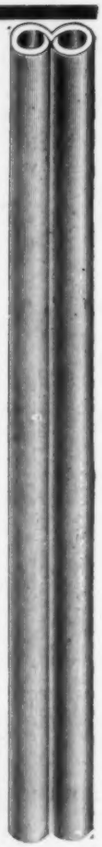

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The Ideal Duplex Drop Wire that snow and sleet **can't** break. Get it **right away.**

Samples and Prices if you ask.

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The Real Success of Any Telephone Company

is largely due to the attitude and opinions of not only the subscribers, but the townspeople in general. Public opinion is based on service and rates.

¶ Low rates do not help poor service—good service aids higher rates. The fact that telephones are cheap in this town or that does not go far towards filling the exchange, when the common complaint is that the service is wretched. Poor telephone service sooner or later causes the appearance of the new company rumor, and other worries for the exchange manager.

¶ The thing that makes the exchange pay best is not that the people in the town who have to use telephones are using them, but that, besides these, a large class are subscribers to whom the telephone is in small part anyway a luxury, but who have a telephone, not only because they need it, but because the service given is so good. That is the all powerful advertisement for the company. Then they take pride in their telephone exchange, and this feeling unconsciously affects everyone, subscriber or not.

¶ In some cities the first thing you hear is a "telephone knocker" and the attitude seems general in the place. In other towns the exchange is spoken well of, and this is the company that is paying the best.

¶ What makes the service so good in one case, and poor in the other? Is it not primarily the apparatus, and is not the backbone of the system the switchboard? One telephone, or a dozen, may give trouble, but this can be easily set right, or the instrument replaced, if necessary; but if it is the switchboard, small or large, whether it be from faulty design or cheap construction, it is a great handicap to the company.

¶ No one knows this better than a switchboard trouble man who has had day and night toil fussing with a crowded, poorly arranged and flimsily constructed switchboard. Yet probably this board, when it was installed, was quite an attractive piece of furniture.

¶ In spite of this some telephone men in an effort to save money for their company will grab a "bargain board," which in the end will cost them just about twice as much as their highest bid.

¶ Every dollar saved in cheap telephone apparatus is a dividend-killer for the company. The switchboard designed by experienced engineers and built of the best material by experienced workmen cannot be sold over the bargain counter.

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¶ If you are interested, study our switchboards in operation.

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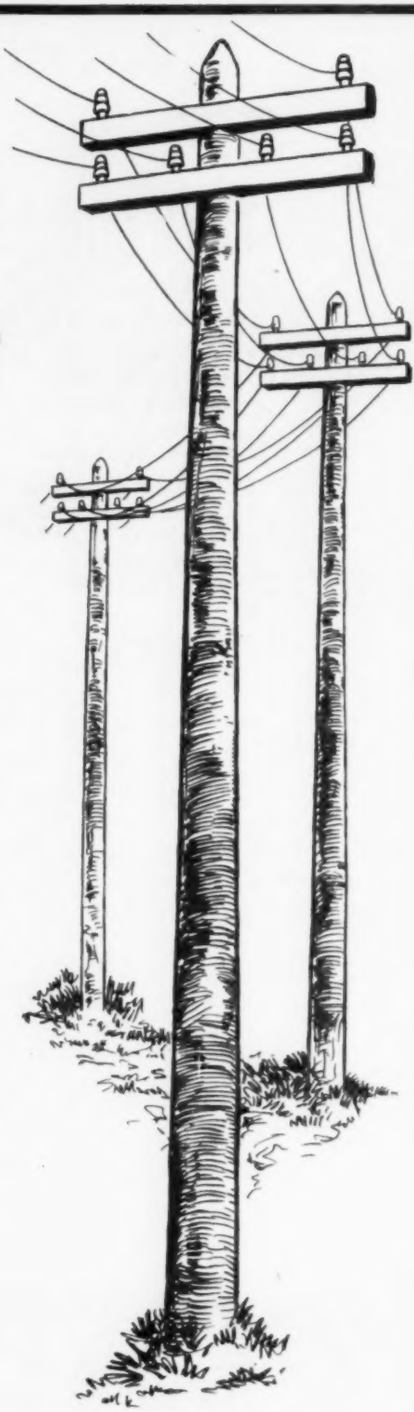

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To the transmitter and receiver which have the same high talking qualities as the transmitters and receivers supplied to all the large telephone companies.

To the generator which has the highest efficiency of any hand generator on the market.

To the ringer which gives a loud, clear signal and is easy of adjustment.

Attention is also called to the switch-hook which is compact and self-contained; to the door which is hinged at the left to facilitate inspection when operating the generator, and to the concealed binding posts which with the simple and pleasing design of the cabinet give the set a most attractive appearance.

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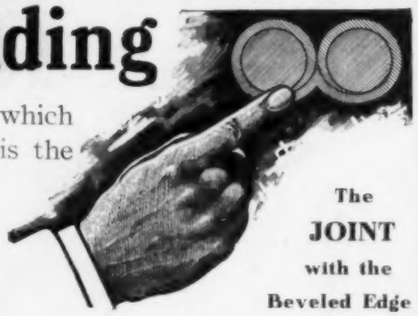
The Harvard Self-Welding Wire Joint

is constructed on a principle which should convince you that it is the only one that CAN wrap tightly around the wire.

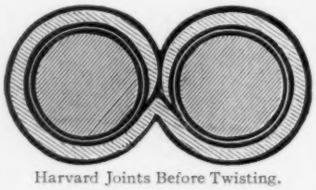


The JOINT with the Beveled Edge

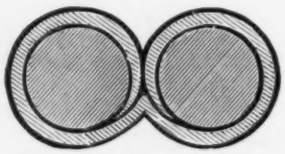
The paper thin beveled edge creeps, crawls, curls and is forced under, around and into every recess at the time the joint is twisted.

The heat generated by the twisting, the force necessary to twist and the ductile nature of the copper in the joint forcing itself into every crevice makes a mechanical weld stronger at any portion than the wire originally was.

Get samples free for the asking.
All sizes carried in stock.



Harvard Joints Before Twisting.



Harvard Joints After Twisting.

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WILL INSTALL 1650 OF THIS TERMINAL (IN VARIOUS SIZES) ON ALL THEIR OUTSIDE CABLE

TYPE M-8

ACTUAL SIZE

10 Pair All Porcelain
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FROM THE ATLANTIC TO THE PACIFIC

Kellogg Switchboard & Supply Co.

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¶ IT'S ALL RIGHT TO MENTION THE REPAIR MAN IN TELEPHONE ADVERTISING WHEN YOU KNOW THAT EVERY SHIPMENT THAT LEAVES THE FACTORY CONTAINS CAREFULLY DESIGNED AND HONESTLY MADE APPARATUS—THE KIND THAT WORKS AND LASTS.

¶ A MAN BUYING HIS FIRST LOT OF TELEPHONES DOESN'T USUALLY HEAR MUCH ABOUT THE REPAIR MAN BEFORE HE HAS BOUGHT, BUT HE IS LIKELY TO HEAR FROM HIM AFTERWARDS.

¶ REPAIRMEN MAY NOT SHINE IN DRAWING ROOMS, BUT THEY ARE DIAMONDS IN THE ROUGH. HONEST? YES, THEYR'E OUT IN THE SUNSHINE TOO MUCH TO BE CROOKED.

¶ ASK A REPAIRMAN WHAT COUNTS IN THE LONG RUN IN TELEPHONE SERVICE.

¶ HE WON'T SAY, "PRICE."

¶ HE WON'T SAY, "LOOKS."

¶ HE'S LIABLE TO SAY "THE KIND THAT HAVE THE LEAST TROUBLE." (THERE HAS TO BE SOME TROUBLE, YOU KNOW, OR HE'LL LOSE HIS JOB.)

¶ AND BY THAT, DOESN'T HE MEAN "SERVICE TELEPHONES?" THE KIND THAT 'STAY IN THE RUNNING' YEAR AFTER YEAR?

¶ THAT'S THE KIND WE PLAN TO MAKE.

¶ ASK THE MAN WITH THE TOOL KIT IF WE SUCCEED.

¶ IF YOU'RE INTERESTED SEND FOR OUR BULLETINS. ADDRESS DEPT. G. WE GIVE EVERY INQUIRY CAREFUL ATTENTION.

Kellogg Switchboard & Supply Co.

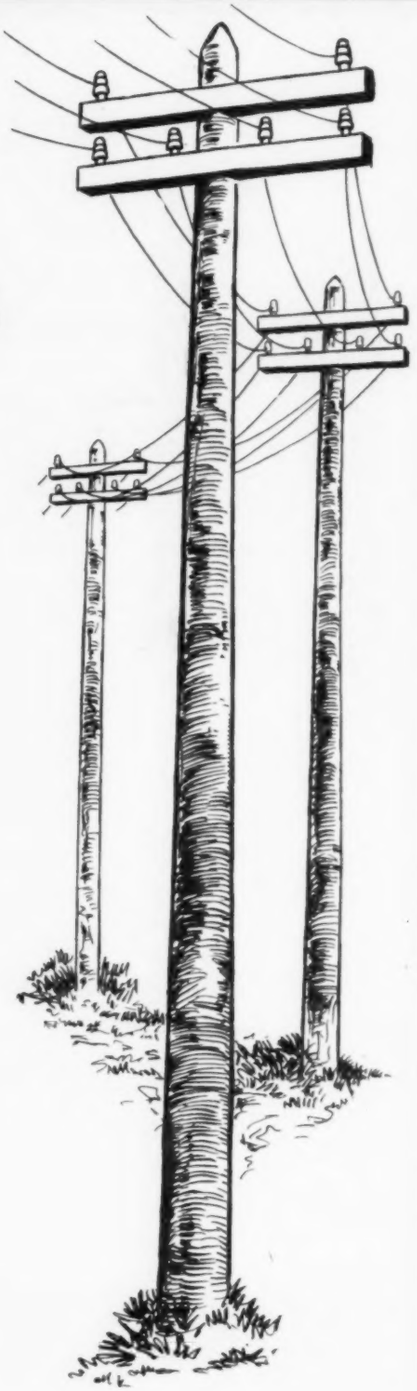
CHICAGO

QUALITY TELEPHONE APPARATUS

We are producers and shippers of

Cedar Poles

"From the Stump to the Line."



We carry large stocks of poles at various points in the states of Michigan, Wisconsin, Minnesota, Idaho, Washington and Maine, and are in a position to make immediate shipment at lowest prices and freight rates.

National Pole Co.

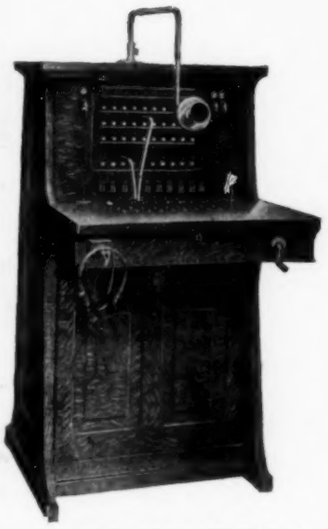
Successors to the Cedar Department of the Pittsburg & Lake Superior Iron Company

Escanaba, Mich.

Private Branch Switchboards

Made by the

Western Electric Company



No. 4 Private Branch Switchboard
30-Line Section

are noted for their high efficiency in transmission, low maintenance expense, long life and simplicity and compactness of design.

The No. 4 private branch switchboard shown here is of the central battery lamp signal type, giving positive supervision. It is made in both 30 and 80 line capacities.

For use in connection with this board our No. 1293-A central battery wall set or our No. 2000 central battery set is particularly well adapted.

The fact that more than 10,000 telephone exchanges in the United States are equipped with Western Electric switchboards and that over 4,000,000 Western Electric telephones are in use indicates that our apparatus is most satisfactory.

Every piece of apparatus is fully guaranteed.

Do Not Fail to Secure Western Electric Prices

No. 1293-A Central Battery Wall Set especially adapted for Business or Residence Use.

WESTERN ELECTRIC COMPANY

EASTERN
New York
Philadelphia
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Pittsburg
Atlanta

CENTRAL
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Indianapolis
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Minneapolis

Manufacturers and Suppliers of all Apparatus and Equipment used in the Construction, Operation and Maintenance of Telephone and Telegraph Plants.

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Kansas City
Denver
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Omaha

PACIFIC
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Los Angeles
Seattle
Salt Lake City

Northern Electric and Manufacturing Co., Ltd., Montreal and Winnipeg

Write Our Nearest House

ONE COPY RECEIVED
MAR 8 1909

IRONITE

The Ideal Duplex Drop Wire that snow and sleet **can't** break. Get it **right away.**

IRONITE

Samples and Prices if you ask.

Durant Electric Supplies Co.
46 Fifth Ave., Chicago

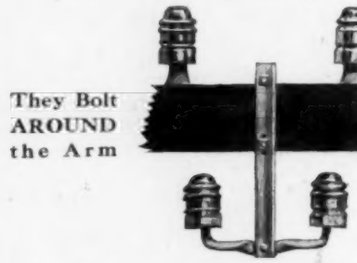
WE ARE ORIGINATORS, NOT IMITATORS

Don't Replace Cross Arms

Get additional pins for new toll lines with

PEIRCE

UNDERHANG BRACKETS



Attached or removed in a minute
(Ask for Bulletin No. 7)

LOOK FOR THE SPRING THREAD

PEIRCE
SPECIALTY CO.
ELKHART, IND.

LOOK FOR THE SPRING THREAD

STONE & GREEN

TELEPHONE EXCHANGE
CONTRACTORS
and ENGINEERS

1361 Monadnock Building, Chicago

We do all kinds of Telephone Engineering and Construction Work. Correspondence invited.

Copper-Clad Steel Wire

WEIGHS LESS
COSTS LESS

Stronger and Better than Any Other Wire

CARRIED IN STOCK AT
CHICAGO ST. LOUIS FORT WORTH

Manufactured by

Duplex Metals Co.

208 FIFTH AVE., NEW YORK

YOUR OPERATORS MAY DO THEIR BEST

—but it is a physical impossibility for a telephone operator to accurately time toll messages with a visible clock dial and pencil. It has repeatedly been proven, of the records of elapsed time so made, that over twenty per cent. show errors of more than one minute on each message.

And furthermore, of this twenty per cent. over ninety per cent. of the errors are in favor of the patron. This means that you, Mr. Telephone Manager, do not in a large number of cases receive payment for service extending beyond the time for which a minimum charge is made. It means that you are losing anywhere from six to fifteen per cent. of the total receipts from your toll business.

There is one way, and only one, for you to do away with these costly errors—install the Calculagraph. It makes absolutely accurate records of time elapsed during toll conversations. It relieves your operators of a great deal of mental and physical effort. It makes them more efficient. It saves you money.

WRITE FOR OUR "REASON WHY" BOOKLETS

CALCULAGRAPH COMPANY

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Agents for Canada: Northern Electric & Manufacturing Co., Limited, Montreal

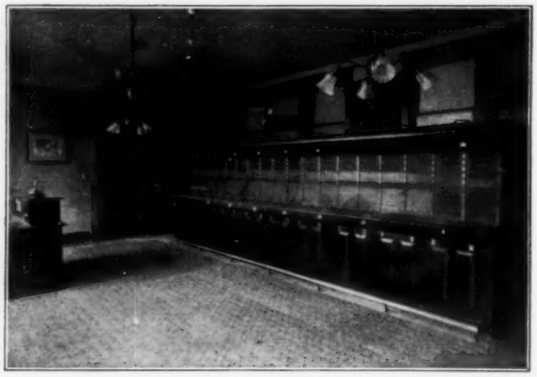
TWO RECENT

Kellogg Installations

Ask Exchange Managers Why Kell

Why "Kellogg" Mea

Reliability? That is It—Brai
—Skill in the Workshop—H
A Standard of Ex



THE GOSHEN SWITCHBOARD.

3-position, 3-section multiple switchboard, mahogany finish. 3,000 lines ultimate, 1,100 lines present installation.

GOSHEN DISTRIBUTING FRAME.

Recent Kellogg installations at Goshen, Ind.

REAR VIEW GOSHEN SWITCHBOARD.

One distributing frame and relay rack, complete. One 1-position chief operator's desk. One 2-position desk type toll board. Two Kellogg, 4 frequency vibrating pole changers.

Kellogg Switchboard & Supply Co.

CHICAGO

QUALITY TELEPHONES AND SWITCHBOARDS

Address Dept. G.

—Complete Exchanges

Kellogg Apparatus Makes Good—

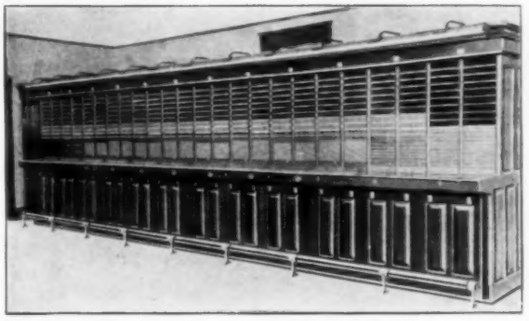
Means Quality

Brains in the Planning
—Honesty in the Selling
of Excellence.

Recent Kellogg installation at Amarillo, Texas

VIEWS SHOWING POWER BOARD, POWER APPARATUS, DESK AND DISTRIBUTING FRAME.

A 1-section, 2-position toll board. A 1-position chief operator and 1-position wire chief desk, distributing frame, power board and power apparatus complete.



THE AMARILLO SWITCHBOARD.

A 4-section, 6-panel multiple Switchboard, with an ultimate capacity of 5,400 lines. The present equipment is 1,200 common battery lines.

Kellogg Switchboard & Supply Co.

BRANCH OFFICES

KANSAS CITY SAN FRANCISCO WINNIPEG, CAN.

Line Supplies, Poles. Write for Bulletins and Prices. Address Dept. G.

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TELEPHONE EXCHANGE CONTRACTORS and ENGINEERS

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We do all kinds of Telephone Engineering and Construction Work. Correspondence invited.

E. A. BUELL, President EDM. CHRISTIAN, Eng. and Gen. Mgr.
PERCY A. SMITH, Asst. Mgr.

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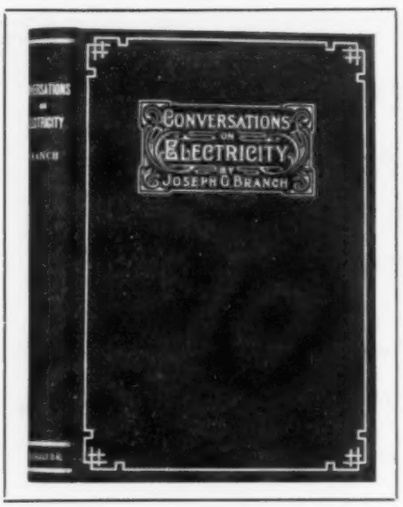
Spanish or English

Conversations on Electricity

By JOSEPH G. BRANCH, B. S., M. E.



FIRST STEPS IN ELECTRICITY

IT has been the author's object to deal with the subject of electricity in as clear and ELEMENTARY a way as possible, so as to familiarize the student with the PRINCIPLES of electricity before undertaking to show how these principles are applied in practical work

The working theory of electricity, or applied electricity, has been developed to a high degree of perfection, and in this volume the author treats EXCLUSIVELY of the PRINCIPLES of electricity and not of its APPLICATION.

The volume treats of the generation of both direct and alternating currents, especial attention being paid to the ALTERNATING current, its generation and application owing to its daily increasing use.

In writing this book the author has chosen the form of DIALOGUE, believing that its impression upon the mind is more penetrating and vivid than ordinary descriptive matter.

The volume contains two hundred and fifty-four pages of text, with seventy illustrations, and a full INDEX.

Price $2.00 Postpaid

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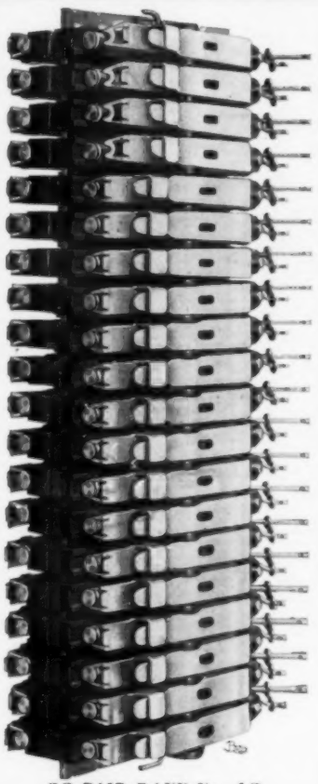


20-PAIR BANK No. 10

300,000

No. 10

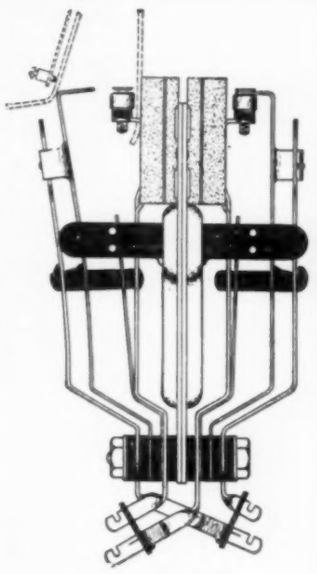
Cook Protectors

IN USE

16,000 Pair installed at St. Louis, with only 19 cases of trouble.

Is a resoldering Protector.
Has ONLY One Contact in the Circuit.
Coils NEVER Burn Out or Short Circuit.
Resoldering a Coil Tests it Automatically.
Many Other Points You Should KNOW About.

WRITE FOR BULLETIN AND PRICES



SECTIONAL VIEW

Frank B. Cook.

237 W. LAKE STREET - - - - - CHICAGO, ILL.

WIRES AND CABLES

For Electrical Purposes

ANY SIZE :: :: ANY SPECIFICAION

SPECIAL ATTENTION GIVEN TO TELE-PHONE WIRES

Atlantic Insulated Wire and Cable Company

120 Liberty Street - - New York City

IRONITE

The Ideal Duplex Drop Wire that snow and sleet **can't** break. Get it **right away.**

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Samples and Prices if you ask.

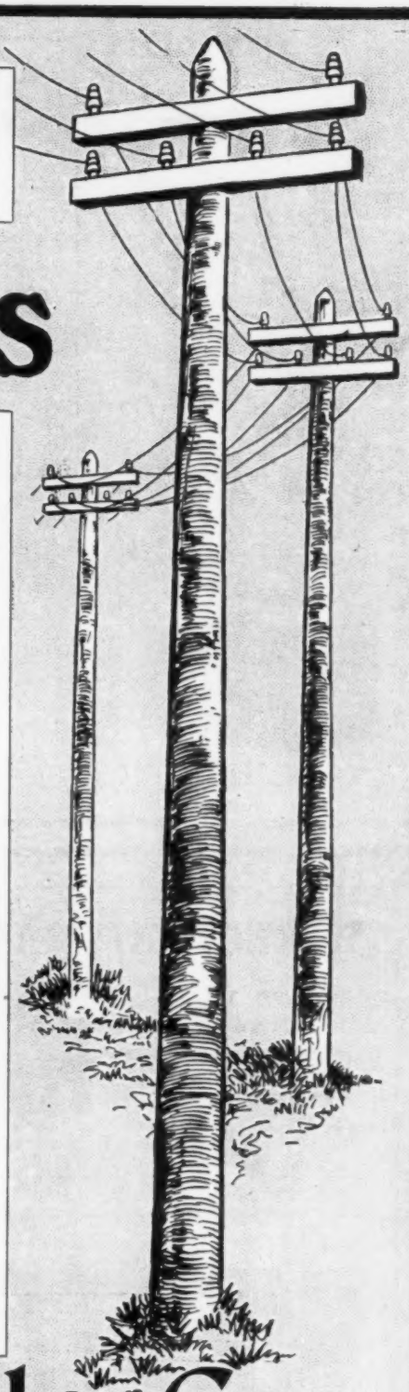
Durant Electric Supplies Co.

46 Fifth Ave., Chicago

APR 5 1909

WE ARE PRODUCERS AND SHIPPERS OF

Cedar Poles



"From the Stump to the Line"

We carry large stocks of poles at various points in the states of Michigan, Wisconsin, Minnesota, Idaho, Washington and Maine, and are in a position to make immediate shipment at lowest prices and freight rates.

National Pole Co.

Successors to the Cedar Department of the Pittsburg & Lake Superior Iron Company

Escanaba, Michigan

Prepare for Storms by Using Western Electric Lead Covered Cable

Lead Covered Cable for up-to-date line construction.

Most telephone companies at some time or other have suffered from the effects of storms which have made their open lines a tangled mass of ruined wires, thus crippling their service and burdening them with an expense which requires the profits of years to defray.

WHY NOT BUY YOUR CABLE NOW?

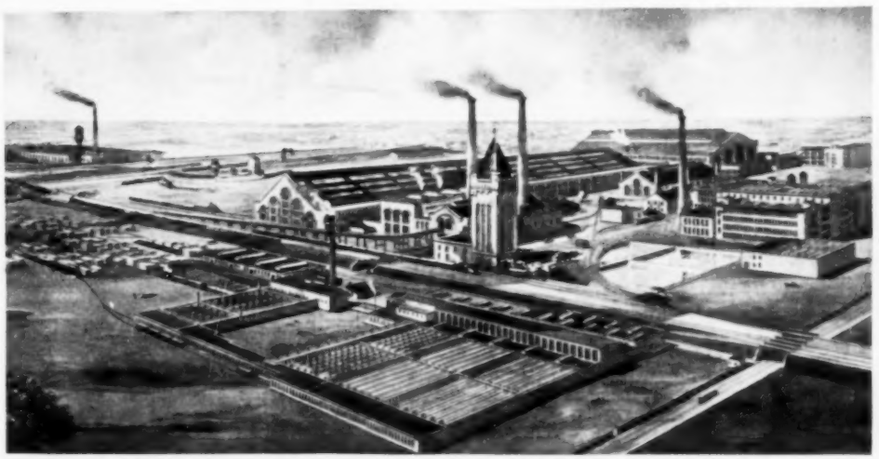
The metal market is at a low point, which means your cable will cost far less now than it will later.

The Western Electric Company is the largest manufacturer of telephone cable in the world. Our plant, our cable experts and our buying facilities are such as make for superior quality and reasonable prices.

Regular and emergency stocks carried at all houses.

We can fill orders of any size promptly.

Write for cable bulletin No. 4361



The Hawthorne Works of the Western Electric Company in which Telephone Cable is manufactured. This one plant covers 150 acres of land and utilizes 847,000 square feet of floor area. Its capacity for turning out Telephone Cable is 20,000,000 conductor feet per day or over 22,727 miles per week.

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Address Our Nearest House

YOU—
Who Use Wire Joints

—You—who want the BEST, but are in doubt

—You—who are "from Missouri" and must be shown

—You—who prefer *proofs* to conversation

LISTEN:

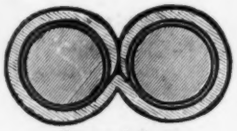
The average joint is made like cross-section view illustrated herewith. It is made wrong, because the outer edges are brought together on the central ridge, and, when twisted, they stay there, and the diameter of the tube is not uniformly decreased, hence air spaces, corrosion, etc.

Other Joints Before Twisting

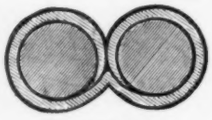
Other Joints After Twisting

Now, it's different with the Harvard Bevel-edge joint—different in one feature only—the beveled edge. This beveled edge gets under the wire, and, when twisted, is FORCED into the recess between the wire and the joint, and the joint grips the wire like a coat of paint.

Makes a permanently perfect joint every time. Free sample to show you.

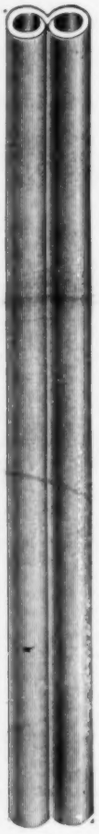


Harvard Joints Before Twisting



Harvard Joints After Twisting

The Beveled edge does it. The more you twist the tighter it grips.



All sizes for copper or iron wire. Do you want the BEST? Then SPECIFY and INSIST on Harvard Joints. Free sample "to show you" if you tell the sizes of wire you use. Have we PROVEN our case? If not, write us. Carried in stock by leading jobbers or direct from the makers, who are

THE HARVARD ELECTRIC COMPANY

61 W. Van Buren St., Chicago, Ill.
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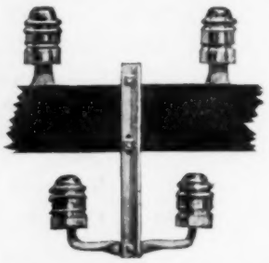
Don't Replace Cross Arms

Get additional pins for new toll lines with

PEIRCE

UNDERHANG BRACKETS

They Bolt AROUND the Arm



They Bolt AROUND the Arm

Attached or removed in a minute

(Ask for Bulletin No. 7)

PEIRCE
SPECIALTY CO.
ELKHART, IND.

The National Conduit & Cable Co.

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41 Park Row, New York, N. Y.

Manufacturers of

Bare Copper Wire and Cable
Weatherproof Wires and Cables
Paper Insulated Cables
For Power, Telephone and Telegraph

BOSTON PHILADELPHIA CHICAGO
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The "Chloride Accumulator" owes its popularity for telephone service to the following facts:

1. The result of over 20 years' experience—made by the oldest Storage Battery Manufacturer.

2. The Company's affiliations with the leading English and Continental makers result in an interchange o inventions and engineering data of remarkable value in solving storage battery problems.

3. Every bit of raw material is tested in the Commercial Laboratory before it is used.

4. Each day's finished product must conform to the Physical Laboratory's rigid standard of specifications for stability and capacity before it is allowed to leave the works.

You will find **The "Chloride Accumulator"** used on nearly all the telephone systems throughout the country.

The Electric Storage Battery Co.

1888 Philadelphia 1909

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San Francisco **Toronto**

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Batteries, Storage.
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Automatic Electric Co.
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$100 CASH PRIZES

In an effort to develop a remedy for the conditions of incivility and discourtesy which are so common betweeen telephone users, and which tends to bring adverse criticism upon all telephone service, **Telephone Engineer** offers to its readers a series of four cash prizes for the four best short articles or essays on telephone etiquette. The conditions governing the competition are as follows. The cash prices offered are:

First prize - -	$50.00
Second prize - -	$25.00
Third prize - -	$15.00
Fourth prize - -	$10.00

Articles shall not exceed two thousand words in length, and may be as short as desired.

Manuscripts should be typewritten, double-spaced and sent folded, not rolled.

All manuscripts or inquiries should be addressed to "Contest Editor, Telephone Engineer, Monadnock Building, Chicago, Ill."

Receipts of manuscripts cannot be acknowledged, nor will unavailable articles be returned.

The contest will be closed September 1, 1909, and prize winners will be announced in the October number of **Telephone Engineer,** the prize winning articles being printed as soon thereafter as possible.

Articles will be read and prizes awarded by a board of judges, whose personnel will be announced in **Telephone Engineer.**

Telephone Engineer reserves the right to buy, at its regular space rates, such articles as are deemed desirable, although not prize winners.

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Roebling's Sons Co., John A.
Wire, Weatherproof.
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In connection with our telephone engineering practice we make a specialty of securing electrical patents for investors, and of giving expert advice in patent matters. We also have facilities for marketing meritorious electrical inventions.

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1361 MONADNOCK BUILDING, CHICAGO

We do all kinds of Telephone Engineering and Construction Work. Correspondence Invited

THE CALCULAGRAPH

Increases Toll Line Earnings

Because every second of "excess time" over the regular periods of time on which the initial or minimum charge is based, is accurately recorded. This "excess time," which is usually lost where messages are timed manually, is converted into dollars by the use of the Calculagraph, thus increasing the earnings of your toll system.

The Calculagraph Makes No Clerical Errors
Get Our Reason Why Booklets

Calculagraph Company

1456 Jewelers' Building NEW YORK CITY

WITH OR WITHOUT DRIP POINTS

THE STANDARD

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Glass Insulators

FOR 40 YEARS

THE BROOKFIELD GLASS COMPANY

MANUFACTURERS

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Telephone Wire

BEST BY EVERY TEST

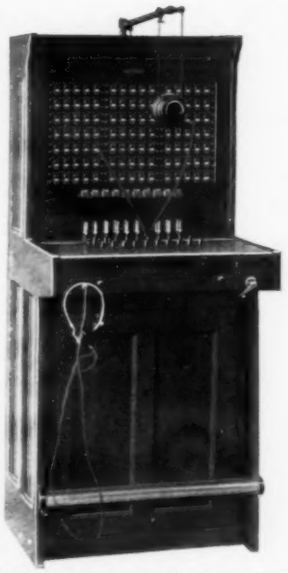
Indiana Steel & Wire Co.

MUNCIE, INDIANA

Magneto Switchboards

Made by the

Western Electric Company



NO. 1220 COMBINED JACK AND SIGNAL SWITCHBOARD. This board has a capacity of 105 Lines and 10 Pairs of Cords.

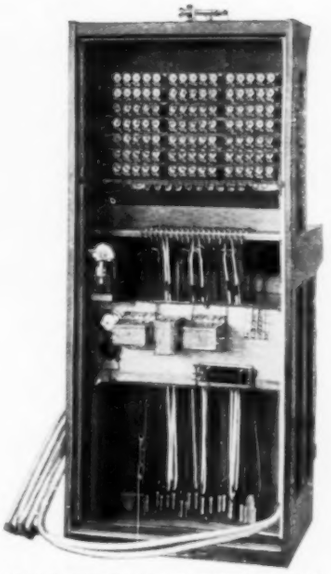
are high in efficiency, compact in design, simple in construction and accessible throughout. Special care has been taken in the arrangement of the apparatus to secure rapid operating conditions. All these features are incorporated in our No. 1220 type of switchboard. The apparatus in this board is of standard

WESTERN ELECTRIC QUALITY

Western Electric
Quality Means
Low Maintenance

Over 10,000 Western Electric telephone switchboards are in use in the United States today.

We carry ready for immediate delivery a complete line of lamp signal, self-restoring drop, manually restored drop, ringer type and cordless boards, all of the very latest design and in all sizes from 10 lines up.



REAR VIEW OF THE NO. 1220 COMBINED JACK AND SIGNAL SWITCHBOARD.

Western Electric Guarantee Protects You

Don't fail to get prices and full information from our nearest house. Write today.

WESTERN ELECTRIC COMPANY

EASTERN	CENTRAL		WESTERN	PACIFIC
New York	Chicago	Manufacturer and Supplier of all Apparatus and Equipment used in the Construction, Installation and Maintenance of Telephone Plants.	Saint Louis	San Francisco
Philadelphia	Indianapolis		Kansas City	Los Angeles
Boston	Cincinnati		Denver	Seattle
Pittsburg	Minneapolis		Dallas	Salt Lake City
Atlanta			Omaha	

Northern Electric and Manufacturing Co. Ltd., Montreal and Winnipeg

AN IDYL OF T

A Kellogg Switchboard in Kellogg Telephones on and a Good Line in

¶ The lineman with good tools on his belt, good climbers strapped to his legs, high grade wire on the reel, sound cross arms and brackets, insulators that fit, and good poles in the ground is just as certain to do nicer, faster work and leave behind him better construction as he is to be more satisfied with himself and his company.

¶ After a few hard storms his company is better satisfied too.

¶ The telephone company that tries to save money by buying a second-class grade of line supplies is the loser in the end.

¶ Isn't this just as true on a small one-wire farm line as on the largest exchange systems?

¶ We will send promptly to those interested our bulletin covering our complete line of supplies and latest price list. Our prices are reasonable.

¶ Our Bulletin No. 45—on rural line construction—is of vital interest to rural companies who are extending their lines; and what companies are not?

Kellogg Switchboard & Supply Co.

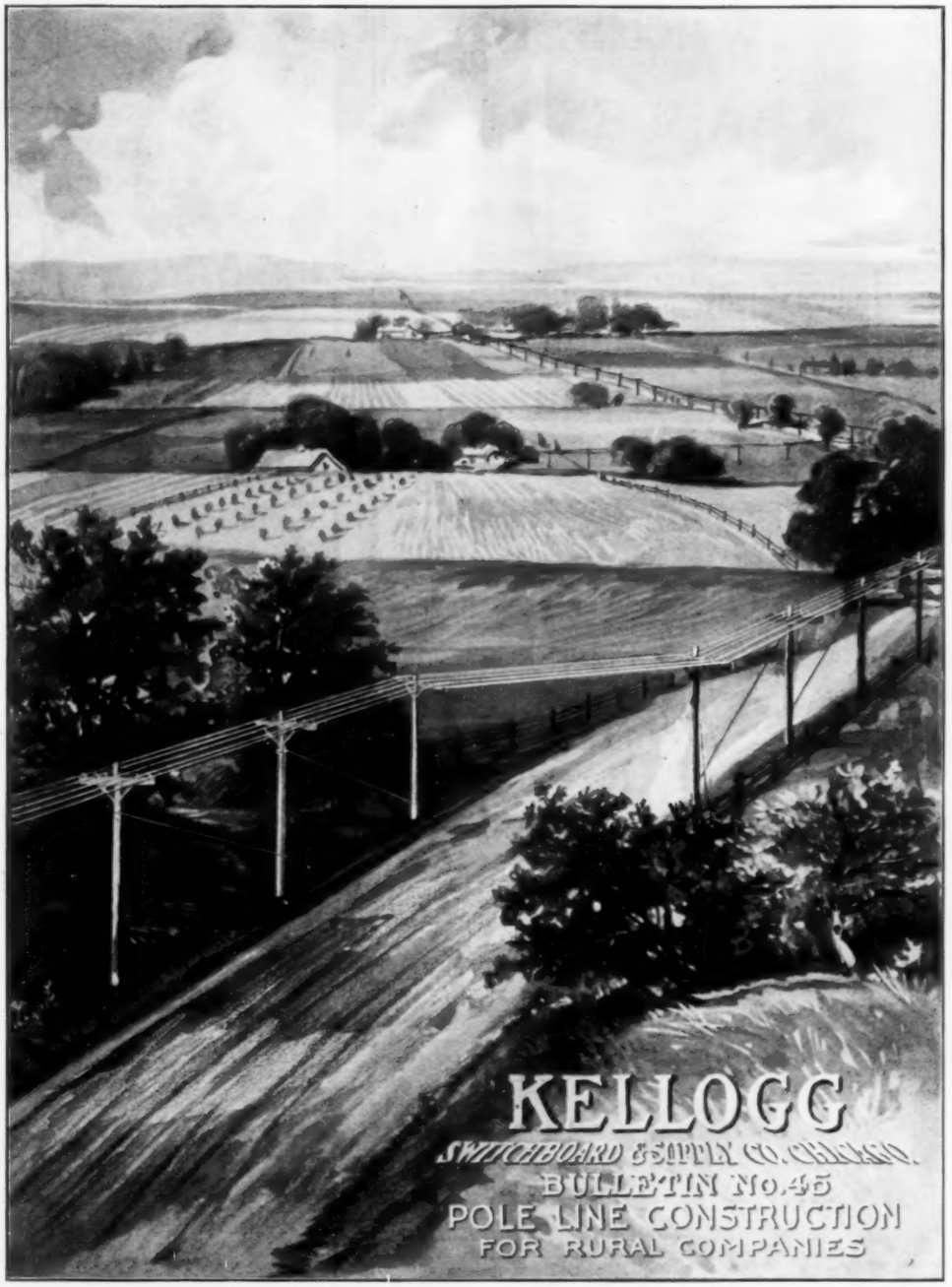
CHICAGO

BRANCH OFFICES: KANSAS CITY. SAN FRANCISCO. WINNIPEG, CAN.

THE LINEMAN

rd in the Operating Room
es on the Right of Way
ne in Between

Illustrating Line Guying when obstacles make a highway crossing necessary. Bulletin No. 45.



Our Illustrated Bulletin No. 17 describes our full line of construction material—wire, brackets, braces, etc., and a complete line of tools and test sets, poles, cross arms, insulators. Our latest price list will be sent promptly with our supply bulletin on request.

OUR BULLETINS:

Nos. 9 and 32 describe Magneto Switchboards.

No. 30 describes Farm Line Telephones.

No. 38 describes Magneto Telephones.

Nos. 11 and 36 describe Common Battery Apparatus.

SIMPLEX

RUBBER INSULATED
TELEPHONE
WIRES
AND
CABLES

CHICAGO OFFICE:
1144 Monadnock Block

THE SIMPLEX ELECTRICAL Co
110 STATE STREET. BOSTON.

WIRES AND CABLES

For Electrical Purposes

ANY SIZE :: :: ANY SPECIFICAION

SPECIAL ATTENTION GIVEN TO TELEPHONE WIRES

Atlantic Insulated Wire and Cable Company
120 Liberty Street - - New York City

E. A. BUELL, President EDM. CHRISTIAN, Eng. and Gen. Mgr.
PERCY A. SMITH, Asst. Mgr.

NORFOLK CREOSOTING COMPANY

Citizen's Bank Building
Norfolk, Va., U. S. A.

A MODERN PLANT Adapted to Filling the Most Rigid Specifications

Send for Descriptive Book
Spanish or English

Joints with Points
THAT ARE WORTH CONSIDERING
THE HARVARD SELF-WELDING WIRE JOINT

Is moisture-proof and therefore non-corrosive.

Get our free samples—twist and cut them. Prove for yourself that you are getting value for your money.

A certain amount of time and labor are necessary to make a good wire joint. You can't buy a good wire joint for the cost of raw copper in its crude state. If you want copper pipe, buy it yourself and make your own joints, but if you want a joint that has been tested under the most rigid conditione and found perfect, write to

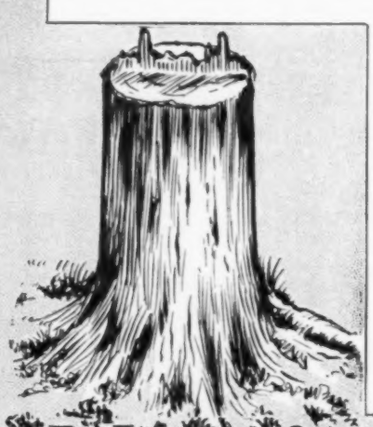
THE HARVARD ELECTRIC CO.
NEW YORK W. Van Buren St., CHICAGO

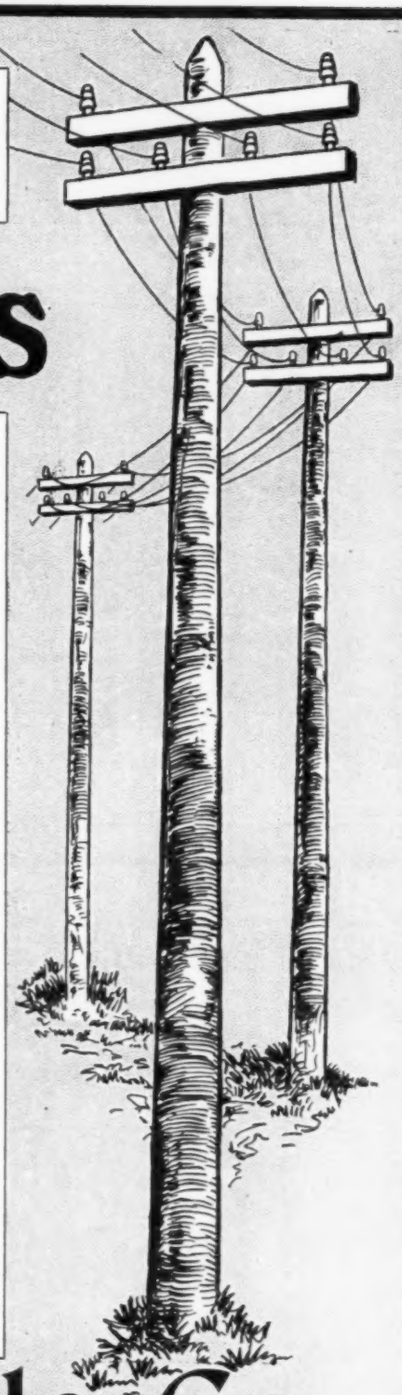
WE ARE PRODUCERS AND SHIPPERS OF

Cedar Poles

"From the Stump to the Line"

We carry large stocks of poles at various points in the states of Michigan, Wisconsin, Minnesota, Idaho, Washington and Maine, and are in a position to make immediate shipment at lowest prices and freight rates.

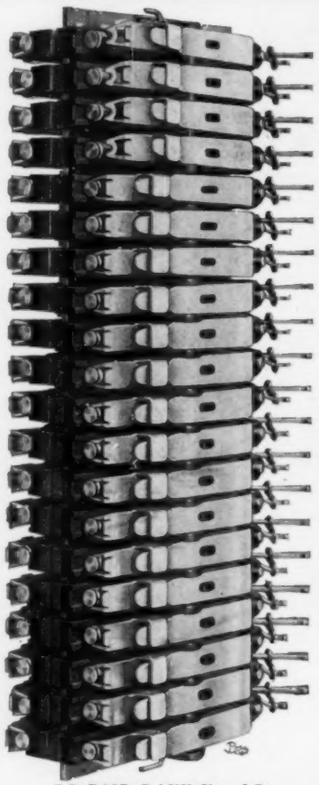




National Pole Co.

Successors to the Cedar Department of the Pittsburg & Lake Superior Iron Company

Escanaba, Michigan



20-PAIR BANK No. 10

300,000

No. 10

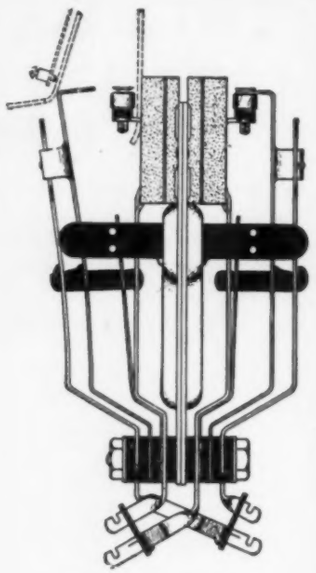
Cook Protectors

IN USE

16,000 Pair installed at St. Louis,
with only 19 cases of trouble.

Is a resoldering Protector.
Has ONLY One Contact in the Circuit.
Coils NEVER Burn Out or Short Circuit.
Resoldering a Coil Tests it Automatically.
Many Other Points You Should KNOW About.

WRITE FOR BULLETIN AND PRICES



SECTIONAL VIEW

Frank B. Cook.

237 W. LAKE STREET - - - - - CHICAGO, ILL.

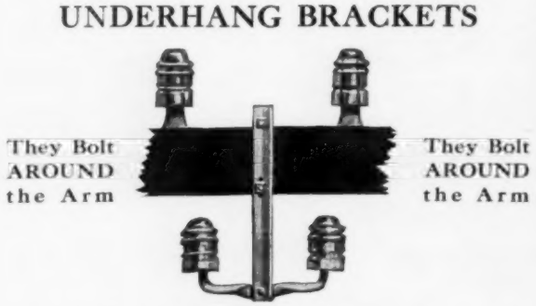
WE ARE ORIGINATO S, NOT IMITATORS

Don't Replace Cross Arms

Get additional pins for new toll lines with

PEIRCE

UNDERHANG BRACKETS



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(Ask for Bulletin No. 7)

LOOK FOR THE SPRING THREAD

PEIRCE
SPECIALTY CO.
ELKHART, IND.

LOOK FOR THE SPRING THREAD

The National Conduit & Cable Co.

EXECUTIVE OFFICES

41 Park Row, New York, N. Y.

Manufacturers of

Bare Copper Wire and Cable
Weatherproof Wires and Cables
Paper Insulated Cables
For Power, Telephone and Telegraph

BOSTON PHILADELPHIA CHICAGO
SAN FRANCISCO

This Battery Is Built Expressly FOR Telephone Service

It's Features

Long Life

Convenient Size

Lowest Polarization

Greatest Recuperative Power

Lightest Weight for Capacity

Costs Less Per Day Than Any Other

Thirty Car Loads

per month

Is Our Output

This Indicates SATISFACTION

It's Advantages

Few Batteries and Less Renewals

Will Fit Any Make of Telephone

Best Transmission Service

Will Last Longer Than Any Other

A Saving in Cost

The Only Battery You Can Safely Tie Up To

Telephone Companies **with over 3,000,000 subscribers** use the Improved Blue Bell Battery exclusively.

WE SHIP FRESH BATTERIES FROM FACTORY TO CUSTOMER

WESTERN ELECTRIC COMPANY

EASTETN
New York
Philadelphia
Boston
Pittsburg
Atlanta

CENTRAL
Chicago
Indianapolis
Cincinnati
Minneapolis

Manufacturers and Suppliers of all Apparatus and Equipment used in the Construction, Operation and Maintenance of Telephone and Telegraph Plants.

WESTERN
Saint Louis
Kansas City
Denver
Dallas
Omaha

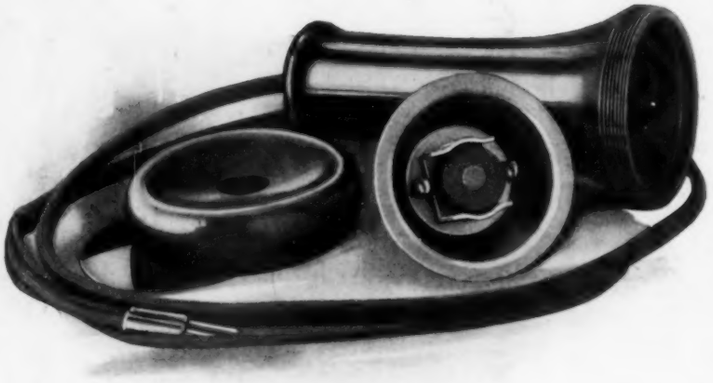
PACIFIC
San Francisco
Los Angeles
Seattle
Salt Lake City

Northern Electric and Manufacturing Co., Ltd., Montreal and Winnipeg

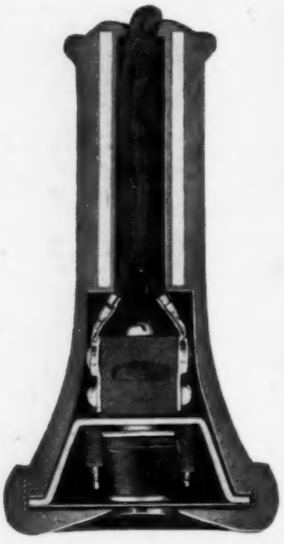
Write Our Nearest House

Automatic Telephone Apparatus

DO YOU KNOW



We are manufacturing a series receiv. r for common battery service constructed on absolutely different lines from the ordinary type, the efficiency of which will save you many dollars in cost of maintenance and depreciation? This is a fact and you will be interested in the following description and cuts.



THE CONSTRUCTION—is on absolutely scientific principles and the efficiency is permanent, which means that a series receiver will be as good in twenty years as it was the day you bought it.

THE TRANSMISSION—is far superior in both volume and quality to that of any other receiver manufactured.

NO PERMANENT MAGNET—only a small electro-magnet with one winding and the simplest possible construction is used.

NO INDUCTION COIL—the receiver is connected in series with the line and transmitter without reference to direction of flow of line current. This feature alone makes the series receiver worth double the amount of any other receiver on the market, as it simplifies the wiring of the telephone and eliminates a large percentage of telephone troubles.

NO ADJUSTMENTS OR ATTENTION—when you install one of these receivers you know that there will be no further expense to maintain it.

AS AN OPERATOR—you must realize the merits of this receiver, and as it is adapted to any common battery plant we do not hesitate to impress upon you the importance of your giving it an immediate personal test.

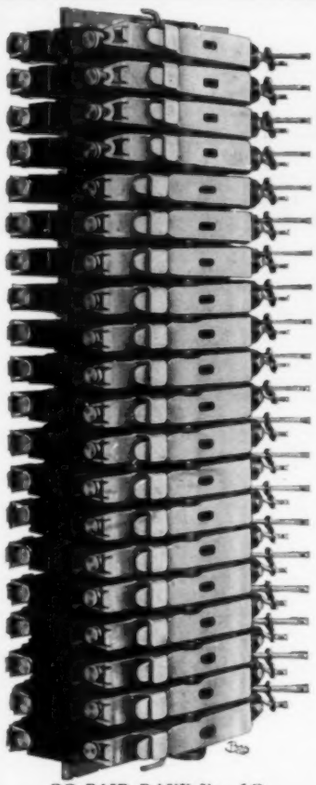
We are equipping all of our new automatic plants with this style receiver.

SEND YOUR ORDER TODAY

Complete Receiver with Composition Shell and Cap, 85 Cents.

Automatic Electric Company

Van Buren and Morgan Streets **CHICAGO, U.S.A.**



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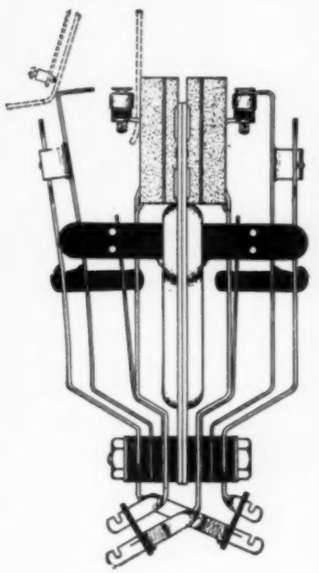

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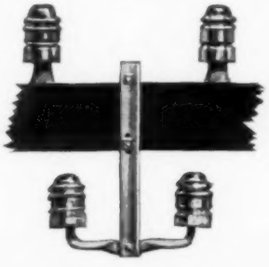
They Bolt AROUND the Arm



They Bolt AROUND the Arm

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Bare Copper Wire and Cable
Weatherproof Wires and Cables
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For Power, Telephone and Telegraph

BOSTON PHILADELPHIA CHICAGO
SAN FRANCISCO

Kellogg Company's Transmitter Pa
by the U. S. Circuit Court of Ap
Grosscup, Baker and

WE REPRODUCE THE LETTER RECEIVED FROM OUR PATENT ATTORN

¶ *An injunction and an accounting are granted against the International Telephone Manufacturing Company, which means that an injunction and accounting would lie against users of the infringing transmitter.*

¶ *We have advised, and now advise, our customers and the trade not to purchase apparatus covered by the patents upon which we have brought suit. This advice has been given, and is now given, in good faith, from friendly motives and for the protection of the trade.*

¶ *A particularly gratifying fact about the decision of the Court of Appeals is the recognition it gives to the superiority of our transmitter as compared with other types of transmitters on the market. Speaking of the Kellogg transmitter the Court in their decision say:*

¶ *"Its utility, its high degree of effectiveness, its commercial success are unquestioned facts. The novelty of none of the claims is gainsaid by any single prior patent or structure."*

¶ *Another suit upon this same transmitter patent against another manufacturing concern will be heard soon.*

KELLOGG SWITCHBOARD AN
CHICAGO ILLI

BRANCH OFFICE
KANSAS CITY SA FRANCI

Manufacturers of High Grade Telephones and Switchboards Complet

ter Patent Held Valid and Infringed
of Appeals (7th Circuit), Judges
ker and Seaman Sitting.

ATEN ATTORNEYS STATING THE EFFECT OF THIS DECISION.

JONES, ADDINGTON & AMES,
ATTORNEYS AND COUNSELORS,

CHICAGO OFFICE
1610 FORT DEARBORN BUILDING
134 MONROE STREET
TELEPHONE RANDOLPH 45

W. CLYDE JONES. ROBERT LEWIS AMES.
KEENE H. ADDINGTON. ARTHUR B. SEIBOLD.

EDWIN B. H. TOWER JR
W. C. MARGESON.
WM PERRY HAHN.
CHARLES L. HOPKINS.
RICHARD HOLLEN.

NEW YORK OFFICE
1904 UNITED STATES EXPRESS BUILDING
2 RECTOR STREET
TELEPHONE 4482 RECTOR

Chicago. Ill., April 13, 1909.

Kellogg Switchboard & Supply Co.,
225 So. Green St., Chicago.

Gentlemen:-

We are pleased to advise you that the United States Circuit Court of Appeals for the Seventh Circuit (Judges Grosscup, Baker and Seaman sitting) today rendered a unanimous decision sustaining the decree entered by Judge Kohlsaat in the Circuit Court in your suit against the International Telephone Manufacturing Company, holding the transmitter patent of the Kellogg Switchboard & Supply Company. No. 687,499, dated November 26, 1901, valid and infringed by defendant as to all the claims in suit. Nos. 1, 2, 8, 10, 11, 13, 15, 16, 17 and 18. Inasmuch as there is no appeal, the decision of the Court of Appeals is final. An injunction and an accounting against the defendant are decreed.

Very truly yours,

Jones Addington & Ames.

RD AND SUPPLY COMPANY
AGO, ILLINOIS

RANCH OFFICES
SAN FRANCISCO WINNIPEG, CANADA

BOARDS COMPLETE EXCHANGES, INTERCOMMUNICATING TELEPHONES SUPPLIES.

ROEBLING

Copper and
Double Galvanized

TELEPHONE WIRE

Galvanized Wire Strand
for Pole Guys
and
Messenger Wire

TELEPHONE CABLES

JOHN A. ROEBLING'S SONS CO., MAIN OFFICE AND WORKS: **TRENTON, N. J.**

BRANCH OFFICES AND WAREHOUSES: PHILADELPHIA, SAN FRANCISCO, CHICAGO, LOS ANGELES, CLEVELAND, SEATTLE, ATLANTA, PORTLAND, ORE.

or, JOHN A. ROEBLING'S SONS CO. OF NEW YORK
NEW YORK BOSTON

THE CALCULAGRAPH

IS A NECESSARY ADJUNCT

To toll line operation and one that no exchange manager can afford to be without. The savings effected, the increase in earnings possible and the increased efficiency of toll operators, where the Calculagraph is used, can be secured by no other means.

IT MAKES NO CLERICAL ERRORS

Get Our Reason Why Booklets

CALCULAGRAPH COMPANY

1456 JEWELERS BLDG., NEW YORK CITY

WITH OR WITHOUT DRIP POINTS

THE STANDARD

BROOKFIELD
Glass Insulators

FOR 40 YEARS

THE BROOKFIELD GLASS COMPANY

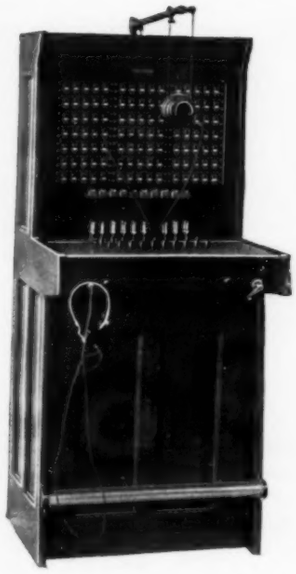
MANUFACTURERS

2 Rector Street, NEW YORK

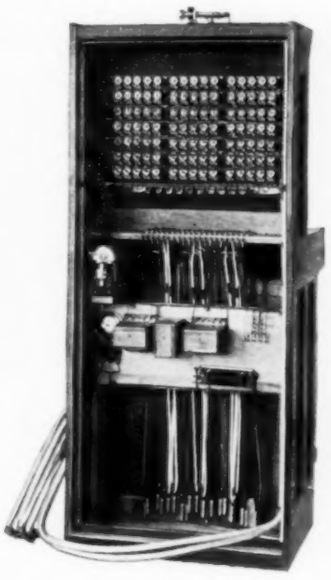
WESTERN ELECTRIC SWITCHBOARDS

are built for lasting and economical service. Their efficiency is indicated by the fact that more than 10,000 telephone exchanges are today equipped with them.

The No. 1220 Magneto Switchboard illustrated here possesses new and practical features that make for reliable, efficient and rapid operation.



Front and Rear Views of the No. 1220 Combined Jack and Signal Board having a Capacity of 105 Lines and 10 Pairs of Cords.



We carry ready for immediate delivery a complete line of magneto and central battery switchboards, all of the latest design and in sizes from 10 lines up. We sell only one grade of apparatus and that is our "Bell" standard.

Never fail to secure Western Electric prices

WESTERN ELECTRIC COMPANY

EASTERN	CENTRAL		WESTERN	PACIFIC
New York	Chicago	Manufacturer of all Telephone Apparatus used by the Entire "Bell" System, with which every Business Man is familiar.	Saint Louis	San Francisco
Philadelphia	Indianapolis		Kansas City	Los Angeles
Boston	Cincinnati		Denver	Seattle
Pittsburg	Minneapolis		Dallas	Salt Lake City
Atlanta			Omaha	

Northern Electric and Manufacturing Co. Ltd., Montreal and Winnipeg

Write Our Nearest House

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RUBBER INSULATED
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WIRES
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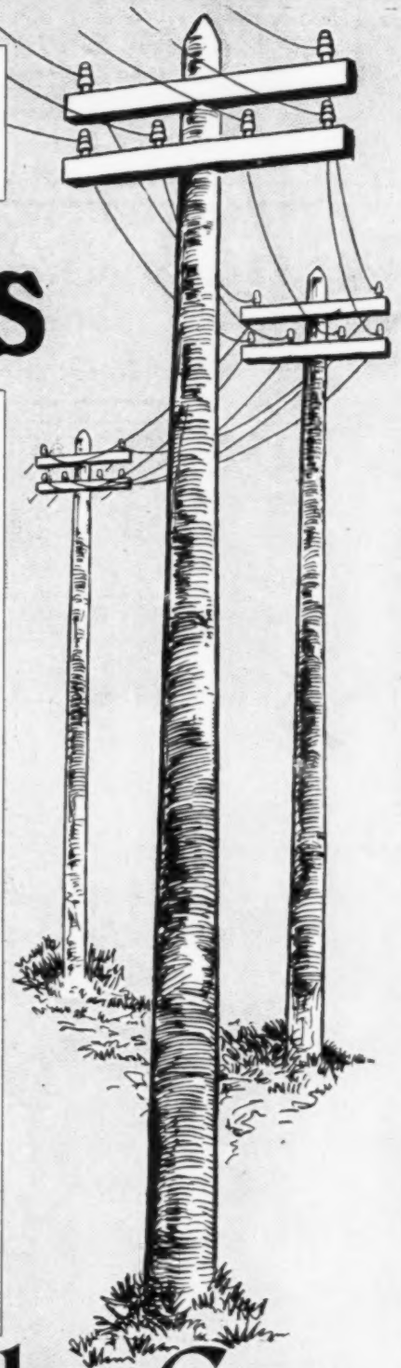

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National Pole Co.

Successors to the Cedar Department of the Pittsburg & Lake Superior Iron Company

Escanaba, Michigan

Samuel G. McMeen Kempster B. Miller
McMeen & Miller
Telephone Engineers
Plans, Estimates, Evaluations, Reports
Consultation Supervision
1452-1456 Monadnock Block . . . . . CHICAGO
333 Grant Avenue . . . . . SAN FRANCISCO

Samuel G. McMeen Kempster B. Miller
McMeen & Miller
Patent Solicitors and Patent Experts
In connection with our telephone engineering practice we make a specialty of securing electrical patents for investors, and of giving expert advice in patent matters. We also have facilities for marketing meritorious electrical inventions.
1452-1456 Monadnock Block . . . . . CHICAGO
333 Grant Ave. . . . . SAN FRANCISCO

Stone & Green Telephone Exchange Contractors and Engineers
1361 MONADNOCK BUILDING, CHICAGO
We do all kinds of Telephone Engineering and Construction Work. Correspondence Invited

Telephone Wire
BEST BY EVERY TEST
Indiana Steel & Wire Co.
MUNCIE, INDIANA

Baird Lever Action Pay Stations

Incomparable Signals. No confusion of operators. Bent coins will not clog. Steel bound cash box. Sealed or locked cash bag. Combination lock.
Write for catalogue.
Baird Manufacturing Company
1581 Briar Place, CHICAGO, ILL.

Bare and Insulated Wires
BARE COPPER WIRE,
"O.K." WEATHER PROOF WIRE,
WEATHER PROOF IRON WIRE,
"PARAC" RUBBER WIRE,
DAMP PROOF OFFICE WIRE,
ANNUNCIATOR WIRE.
PHILLIPS INSULATED WIRE CO.
PAWTUCKET, R. I.

The **Paragon Battery Box**
will save you in broken batteries, broken connections and trouble shooting, more than five times its cost every year. Makes a nice, neat looking job, too.
F. W. PARDEE,
46 Fifth Avenue, - Chicago, Ill.

Eliminate Half the Ringing by Using Magneto Telephone Apparatus

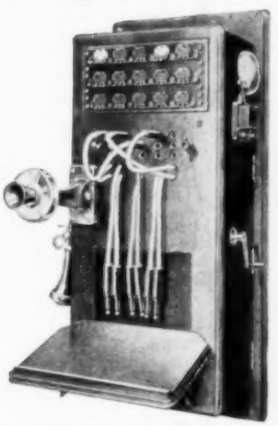
Made by the

Western Electric Company

Our No. 106 magneto switchboard, shown here, is for use where the parties on a line desire to call each other without signaling "central" or to call "central" without ringing the other parties.

It has a night alarm bell, a powerful 5-bar generator, 4 cord circuits and may be equipped with 10 rural lines and 1 toll line or for 11 rural lines.

The apparatus is compactly arranged for mounting on the wall, and is readily accessible for inspection and tests.



No. 106 Magneto Switchboard

No. 1317-L Magneto Wall Set

Our No. 1317-L. push button type telephone set is designed for use in connection with the No. 106 switchboard. It possesses all the valuable features which make for efficiency, convenience and economy in a telephone set. Its high grade construction insures low maintenance expenses for you and efficient and satisfactory service for your subscribers.

Every piece of telephone apparatus made by the Western Electric Company carries with it the full guarantee of a Company which has over 4,000,000 of its telephones in successful operation, and over 10,000 exchanges equipped with its telephone apparatus.

Write our nearest house today for Bulletin No. 4365.

WESTERN ELECTRIC COMPANY

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New York	Chicago	Manufacturer of all Telephone Apparatus used by the Entire "Bell" System with which every Businsss Man is familiar.	Saint Louis	San Francisco
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Boston	Cincinnati		Denver	Seattle
Pittsburg	Minneapolis		Dallas	Salt Lake City
Atlanta			Omaha	

Northern Electric and Manufacturing Co., Ltd., Montreal and Winnipeg

JUN 4 1909

Automatic Telephone Equipment

Does Your Exchange Pay Dividends?

WHY doesn't it pay? Is the reason bad management or bad equipment? More likely the latter.

Probably the company is trying to do a 20th Century business with 19th Century apparatus.

If that's the case, it is spending more and earning less than it might if it had our Automatic Telephone Equipment.

This is the only really modern telephone system. It produces the ideal telephone service—quick, sure and secret—at half the operating expense of a manual equipment, and this service commands better rates.

It costs a fixed price per hundred lines to enlarge the automatic exchange, instead of an increased price per each hundred lines, as in the manual equipment.

The automatic exchange is never outgrown; it never has to be "scrapped" and replaced by a complete new one, as with the manual. You just add to it as you do to a sectional book case.

All these points bear upon the stability and value of your telephone securities. They mean dividends to you.

Our Automatic System has been adopted in the following cities:

Aberdeen, South Dakota.
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First prize - -	$50.00	Third prize - -	$15.00
Second prize -	$25.00	Fourth prize -	$10.00

Articles shall not exceed two thousand words in length, and may be as short as desired.

Manuscripts should be typewritten, double-spaced and sent folded, not rolled.

All manuscripts or inquiries should be addressed to "Contest Editor, Telephone Engineer, Monadnock Building, Chicago, Ill."

Receipt of manuscripts cannot be acknowledged, nor will unavailable articles be returned.

The contest will be closed September 1, 1909, and prize winners will be announced in the October number of **Telephone Engineer,** the prize winning articles being printed as soon thereafter as possible.

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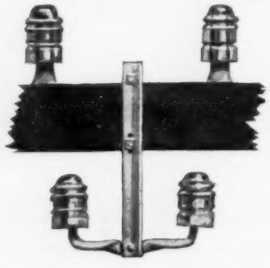

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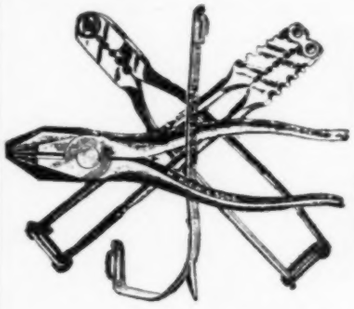

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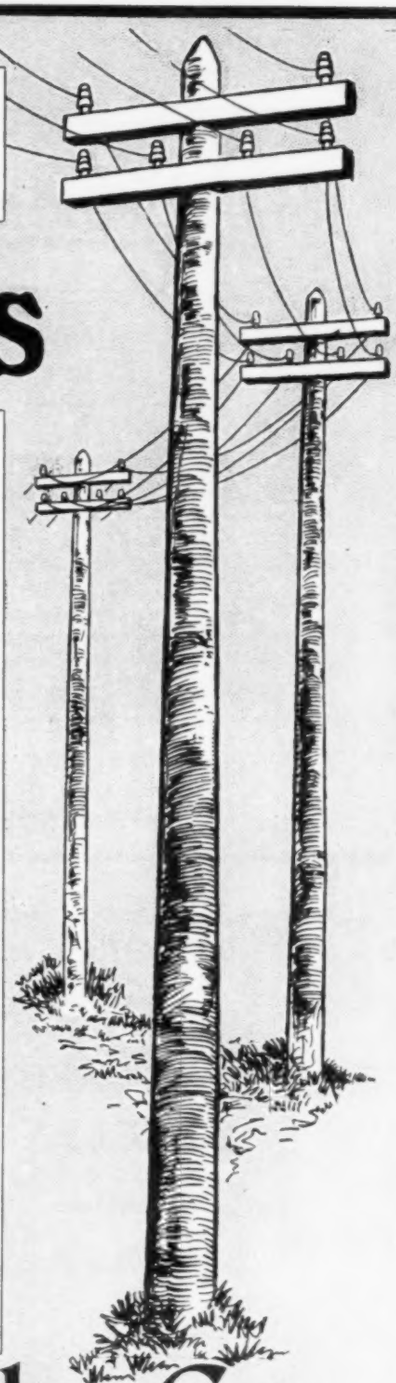

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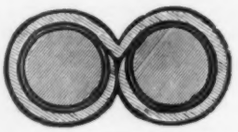

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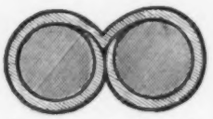

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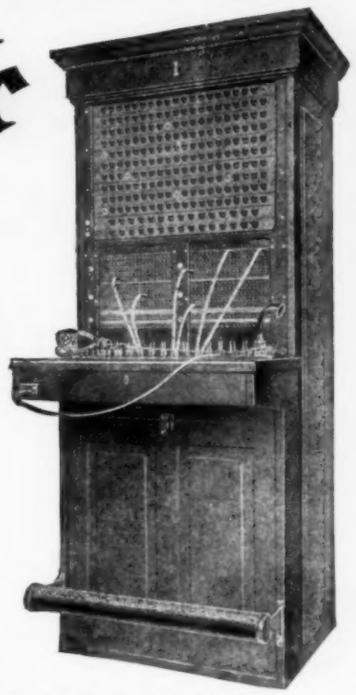

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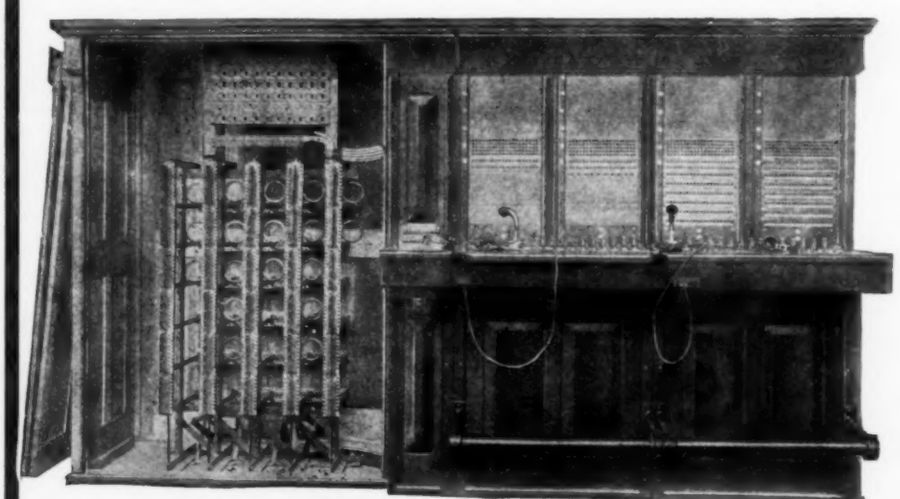

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Kellogg Switchboard & Supply Co.
Western Electric Co.

Telephones.
Automatic Electric Co.
Kellogg Switchboard & Supply Co.
Western Electric Co.

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American Electric Fuse Co.
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Terminals, Cable.
American Electric Fuse Co.

Tools.
Klein & Sons, Mathias.

Transmitters.
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Kellogg Switchboard & Supply Co.
Western Electric Co.

Wire Annunciator.
Phillips Insulated Wire Co.

Wire, Copper.
Atlantic Insulated Wire & Cable Company.
National Conduit & Cable Co.
Phillips Insulated Wire Co.
Roebling's Sons Co., John A.

Wire, Galvanized Iron.
Indiana Steel & Wire Co.
Roebling's Sons Co., John A.

Wire, Strand.
Indiana Steel & Wire Co.
Phillips Insulated Wire Co.
Roebling's Sons Co., John A.

Wire, Weatherproof.
Atlantic Insulated Wire & Cable Co.
Kerite Insulated Wire Co.
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Phillips Insulated Wire Co.
Roebling's Sons Co., John A.
Safety Insulated Wire & Cable Co.
Simplex Electrical Co.

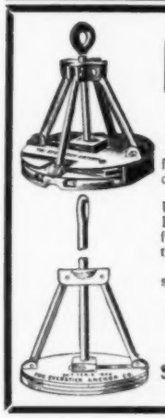
Brownell Booths

Are the Best

WRITE FOR CATALOGUE

C. H. BROWNELL

PERU, INDIANA



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The Anchor of Merit

Cuts show two-way and four-way Everstick Anchors closed and expanded.

Largest companies in the United States are using Everstick Anchors successfully, and thousands of them.

Write for prices and descriptive booklet.

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St. Louis, Mo., U. S. A.

American Electrical Works

PHILLIPSDALE, R. I.

GALVANIZED TELEPHONE

WIRE

SIEMENS-MARTIN HIGH STRENGTH AND EXTRA HIGH STRENGTH GALVANIZED STRANDS

OF HIGHEST QUALITY

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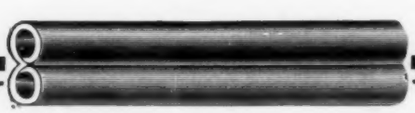
Phillipsdale, R. I. St. Louis, Mo. Syracuse, N. Y. Kansas City, Mo.
Chicago, Ill. Dallas, Tex. Atlanta, Ga.



QUALITY

There are a great many details that have to be considered in making wire joints of quality; one of the important ones is

COPPER

The majority of people think that copper is copper, the same as a few years ago telephone men thought that iron wire was iron wire; but today we know that there are special grades of wires, especially compounded to meet the duty required of them, such as BB, EBB, etc., so it is with copper. In making our bevel edged joints we use a 90% pure copper. Extra tough and especially annealed; each separate width from which joints are made being particularly selected for the service required of it. It must be just the right degree of hardness, not so hard that it will crack when twisted or so soft that it will bend and damage in the tool kit. The grain must be close so that it forms a tight waterproof covering for your wires, not porous, which might have a tearing tendency. All the copper used in Harvard Bevel Edged Copper Self Welding wire joints is the result of years of experience and experimenting and is one of the reasons why our joints look so well and give such great efficiency which has made them

THE STANDARD OF THIS COUNTRY

This care in selecting just the right copper and other painstaking methods may make them cost a trifle more, but if you want good joints specify them to your dealer or direct from us

HARVARD ELECTRIC CO.

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McROY

STANDARD
VITRIFIED CLAY

CONDUITS

ARE THE KIND
THAT OTHER
COMPANIES TRY
TO MANUFACTURE

McROY CLAY WORKS

ROOKERY BLDG.
CHICAGO, ILLINOIS

Factory: Brazil, Ind.

ONE HUNDRED DOLLARS
IN
CASH PRIZES

In an effort to develop a remedy for the conditions of incivility and discourtesy which are so common between telephone users, and which tend to bring adverse criticism upon all telephone service, **Telephone Engineer** offers to its readers a series of four cash prizes for the four best short articles or essays on telephone etiquette. The conditions governing the competition are as follows. The cash prices offered are:

First prize - -	$50.00	Third prize - -	$15.00
Second prize -	$25.00	Fourth prize -	$10.00

Articles shall not exceed two thousand words in length, and may be as short as desired.

Manuscripts should be typewritten, double-spaced and sent folded, not rolled.

All manuscripts or inquiries should be addressed to "Contest Editor, Telephone Engineer, Monadnock Building, Chicago, Ill."

Receipt of manuscripts cannot be acknowledged, nor will unavailable articles be returned.

The contest will be closed September 1, 1909, and prize winners will be announced in the October number of **Telephone Engineer,** the prize winning articles being printed as soon thereafter as possible.

Articles will be read and prizes awarded by a board of judges, whose personnel will be announced in **Telephone Engineer.**

Telephone Engineer reserves the right to buy, at its regular space rates, such articles as are deemed desirable, although not prize winners.

"1900"
DRY BATTERIES

A scientific investigation of the "1900" proves conclusively its SUPERIORITY for Telephone Service

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GENERAL SALES OFFICE
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BARE COPPER WIRE,
"O.K." WEATHER PROOF WIRE,
WEATHER PROOF IRON WIRE,
"PARAC" RUBBER WIRE,
DAMP PROOF OFFICE WIRE,
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PHILLIPS INSULATED WIRE CO.
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THE MARKET, AND ANY PART SHOWING AN IN- HE
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Every detail of the working parts of the Kellogg transmitter is designed to reduce loss of imparted energy, and secure responsiveness, accuracy and delicacy of movement. The result combines volume and purity of tone, with an articulation which is as natural as the voice itself.

Summing up the results secured, which make the Kellogg transmitter what it is, we have:

1. The most far-reaching transmission possible, suited for long distance and local connections.

2. An instrument not affected by foreign sounds or noises in the room.

3. An instrument which will transmit perfectly when talking into its mouthpiece in the lowest tones.

4. An instrument which will not blur nor break when forcing transmission (talking loud.)

5. A transmitter which is proof against "packing" or becoming dead from regular use.

6. An instrument not affected by internal heat, its construction being such as to radiate heat rapidly.

7. Minimum battery consumption.

8. A self adjustable transmitter which is always set right for highest efficiency.

9. An instrument which will stand the most severe abuse without materially affecting its talking qualities.

10. Small number of parts, accurately made from the best material obtainable, reducing possible chances for trouble to a minimum.

11. Durability and long life, obtained from careful selection of material used in its construction.

12. A "perfect transmitter."

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CHICAGO Get Our Prices on POLES

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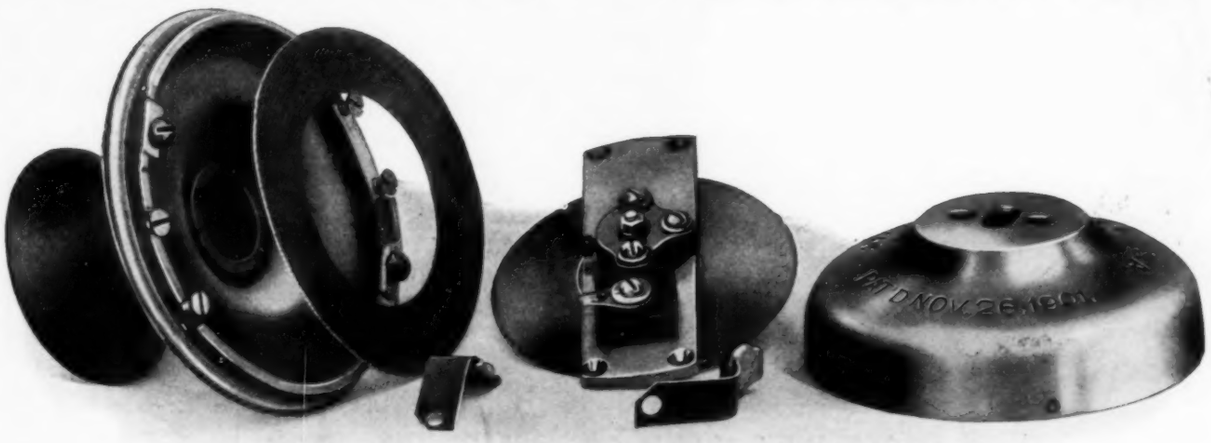
Manufacturers of High Grade Telephones and Switchboards.

IS GUARANTEED SUPERIOR TO ANY OTHER MAKE ON
IN- HERENT DEFECT WITHIN FIVE YEARS WILL BE
GE ON BEING RETURNED TO THE COMPANY.



Disassembled view of the Kellogg Transmitter—showing every part—including linen gasket.

The back view and cover.

OVER THREE-QUARTERS OF A MILLION IN USE TODAY

DURABILITY

is the test of true economy in the use of galvanized telephone wire.

DURABILITY depends more than anything else upon the quality of the galvanizing.

Roebling Double Galvanized Telephone Wire

is a durable wire because it is protected by real galvanizing; given an extra heavy coating of the best zinc spelter applied by methods directed by the experience of more than half a century.

It costs a little more than ordinary galvanized wire. It is worth a great deal more.

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KERITE has back of it an unequalled record of half a century of successful service under the most adverse conditions. It improves instead of deteriorating with age.

Efficiency and safety in electrical installations depend chiefly on insulation. For fifty years KERITE insulation has been the standard of excellence.

Results count. KERITE wires and cables installed half a century ago are in service to-day. The wonderful durability of KERITE insures the highest safety and economy.

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The indestructibility of KERITE and its power to resist deteriorating influences should be carefully considered in specifying an insulated wire or cable.

Experience of others should be useful to you. Insure your service by using KERITE.

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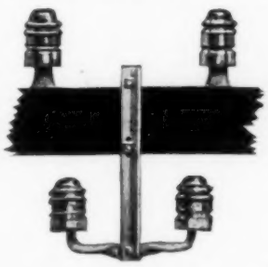

They Bolt AROUND the Arm

Attached or removed in a minute

(Ask for Bulletin No. 7)

LOOK FOR THE SPRING THREAD

PEIRCE
SPECIALTY CO.
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LOOK FOR THE SPRING THREAD

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Bare Copper Wire and Cable
Weatherproof Wires and Cables
Paper Insulated Cables
For Power, Telephone and Telegraph

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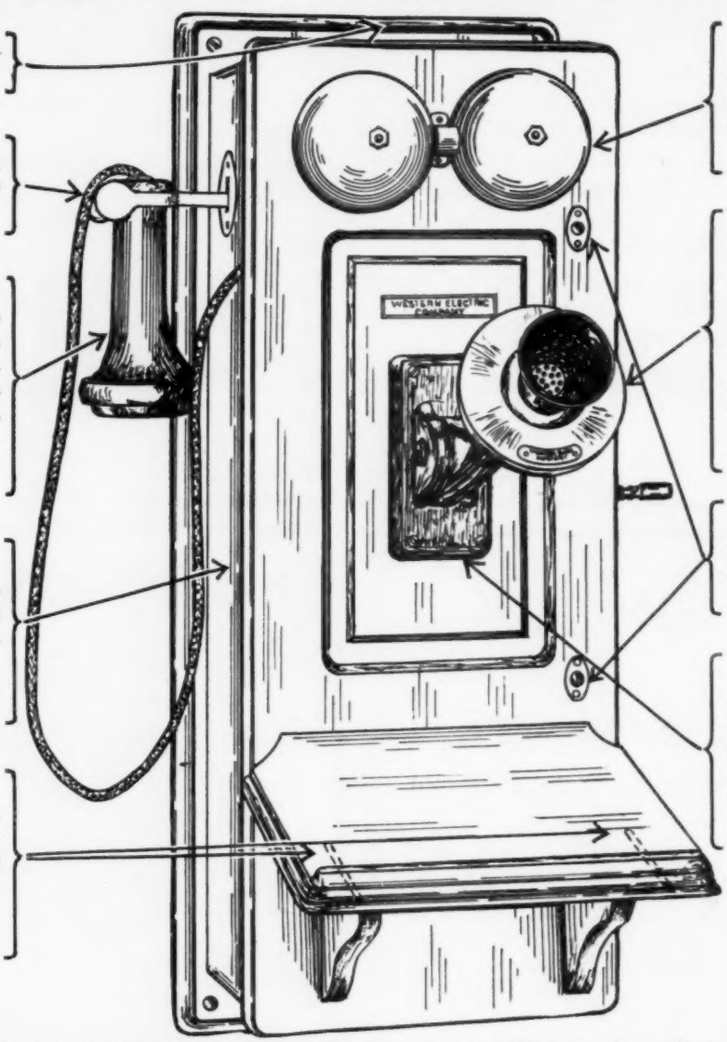
SAN FRANCISCO

THE NEW No. 1317 TYPE

Western-Electric

MAGNETO TELEPHONE


NO OUTSIDE BINDING POSTS.
THE SWITCH HOOK IS COMPACT AND SELF-CONTAINED.
THE STANDARD "BELL" TYPE RECEIVER, OR THE INTERIOR BINDING POST TYPE, FURNISHED AS DESIRED
THE CABINET IS SUBSTANTIALLY MADE AND IS OF ATTRACTIVE DESIGN.
TWO HARD OAK DOWEL PINS ARE PLACED IN EACH SHELF AS A REINFORCEMENT.
THE LARGE 3-INCH BRASS GONGS GIVE A LOUD, CLEAR TONE.
THE STANDARD "BELL" TYPE TRANSMITTER HAS MAXIMUM EFFICIENCY. IT SPEAKS FOR ITSELF.
SPECIAL SELF-ADJUSTING LOCK.
NOTE THE FOUR SCREWS WHICH HOLD THE TRANSMITTER ARM FIRMLY IN PLACE.

This is the latest and best Magneto Telephone ever developed. Its efficiency, reliability and satisfactory service are guaranteed.

Over 100,000 No. 1317 Sets have been sold in the last few months.

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Manufacturer of all Telephone Apparatus used by the entire "Bell" System.

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San Francisco, Seattle, Los Angeles, Salt Lake City.

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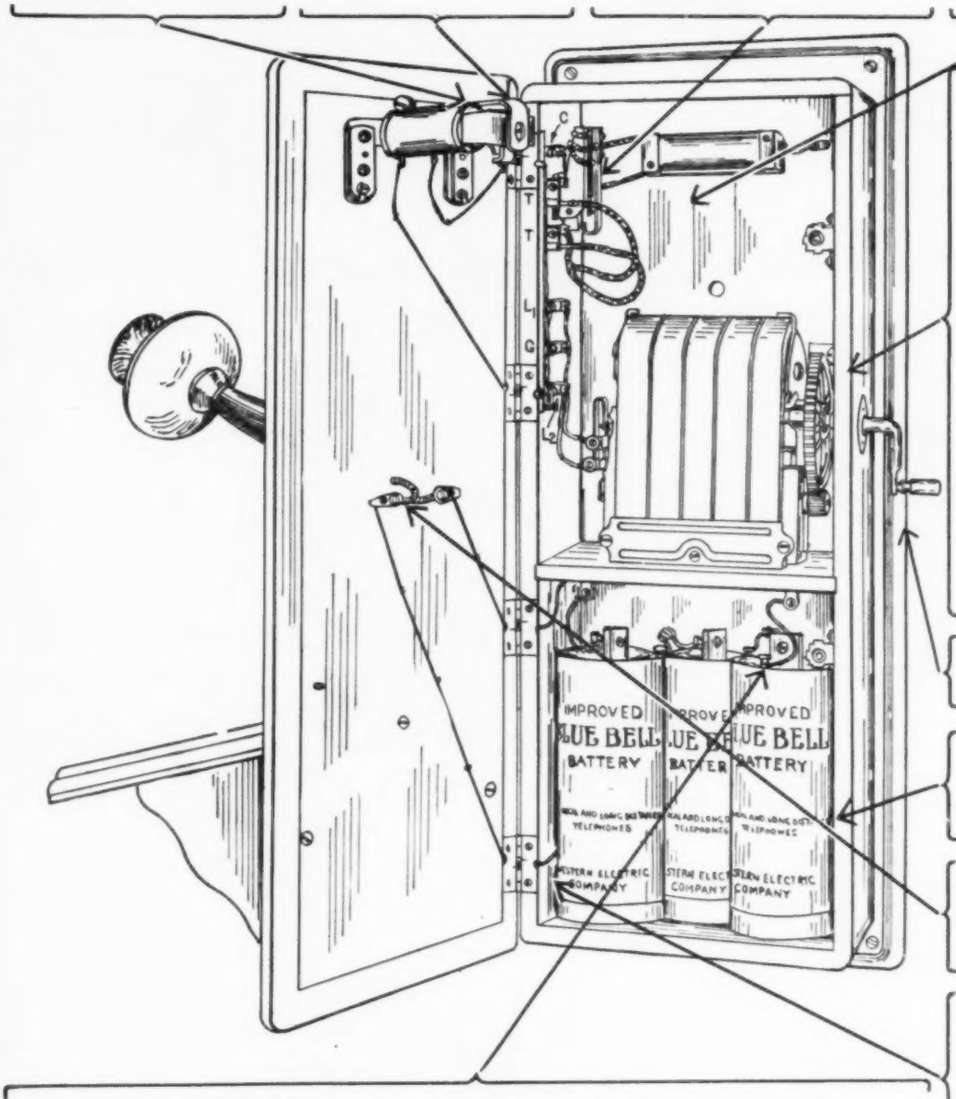
THE FAMOUS No. 38 TYPE RINGER. TO ADJUST THE GONGS WITH SCREW-DRIVER, SIMPLY UNFASTEN LOCK NUTS AND TURN ECCENTRIC.

JUST A TURN WITH AN ORDINARY SCREW DRIVER ADJUSTS THE ARMATURE. NO NUTS OR WRENCHES NEEDED.

ALL SWITCH-HOOK SPRINGS HAVE PLATINUM POINT CONTACTS AND ARE MOUNTED VERTICALLY TO PREVENT DUST SETTLING ON CONTACTS.

SPACE PROVIDED FOR CONDENSERS.



THE No. 48 TYPE GENERATOR IS THE MOST POWERFUL TELEPHONE GENERATOR MADE, AND BEING NORMALLY OFF THE LINE CANNOT BE INJURED BY LIGHTNING. THE ACT OF TURNING AND STOPPING THE CRANK AUTOMATICALLY PUTS THE GENERATOR ON AND OFF THE LINE.

THE MAGNETS ARE OF SPECIALLY HARDENED STEEL.

ONE-PIECE GENERATOR CRANK.

SPACE FOR THREE CELLS OF DRY BATTERY.

ATTACH TRANSMITTER CORD WITH SCREW CLIPS—NO SOLDERING REQUIRED.

DOOR IS HINGED ON LEFT SO YOU CAN SEE RINGER WHEN ADJUSTING IT. ALL PARTS VISIBLE WHEN TURNING THE CRANK.

THE BATTERY TERMINAL LUGS ARE ARRANGED WITH SCREW CONNECTIONS. NO SOLDERING NECESSARY WHEN LEADS BREAK. FLEXIBLE BATTERY CONNECTING WIRES ARE FURNISHED.

We are prepared to ship by prepaid express one No. 1317 Type Magneto Telephone Set to every responsible Telephone Company, for thirty days' free trial. If the Telephone set is not satisfactory, it may be returned at our expense. Every telephone man should accept this offer.

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Telephone Exchange Contractors and Engineers

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ASK FOR OUR

SPECIAL SUBSCRIPTION PROPOSITION

It offers something worth while

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IT STANDS FOR QUALITY IN POLES

THE BRAND OF QUALITY

THE FINEST CEDAR POLES PRODUCED

COME FROM OUR YARDS

COMPLETE STOCKS & PROMPT SHIPMENTS

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Incomparable Signals. No confusion of operators. Bent coins will not clog. Steel bound cash box. Sealed or locked cash bag. Combination lock.

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QUICK SHIPMENTS
ANYWHERE IN U. S.

Being producers of poles, we know what poles cost. And as pole producers, with these costs always in mind, we sell at close prices. By placing your specifications in our hands, we will quote sufficiently attractive figures to secure your order and merit continued patronage. **Let Us Prove It!**

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SAFETY

RUBBER INSULATED

TELEPHONE WIRES and CABLES

SEAMLESS RUBBER SAFETY INSULATIONS

Rubber Covered Paper Covered
High or Low Tension
Light and Power Cables

THE SAFETY INSULATED WIRE & CABLE COMPANY

114 LIBERTY STREET, NEW YORK CITY

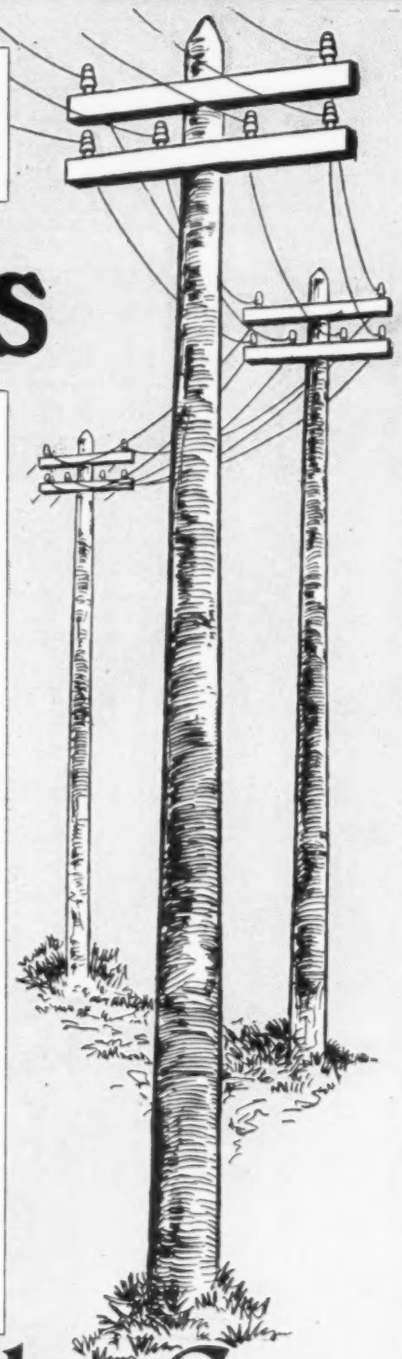
BOSTON CHICAGO ATLANTA SAN FRANCISCO

WE ARE PRODUCERS AND SHIPPERS OF

Cedar Poles

"From the Stump to the Line"

We carry large stocks of poles at various points in the states of Michigan, Wisconsin, Minnesota, Idaho, Washington and Maine, and are in a position to make immediate shipment at lowest prices and freight rates.



National Pole Co.

Successors to the Cedar Department of the Pittsburg & Lake Superior Iron Company

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RUBBER INSULATED
TELEPHONE
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For Electrical
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ANY SIZE :: :: ANY SPECIFICATION

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A MODERN PLANT Adapted to Filling
the Most Rigid Specifications

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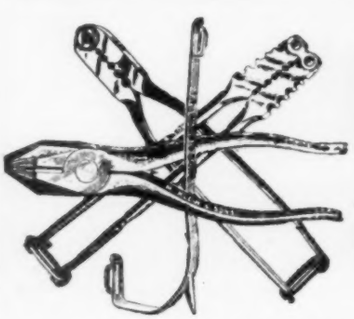

Klein
Tools

Carbondale, Ill., June 14, 1909
Mathias Klein & Sons, Chicago, Ill.
Gentlemen:—Please quote me a price on your Pocket Kit. I have been using your tools for thirty-one years and think they are good.
Respectfully, John A. Boothley, Chief Inspector,
C. & M. V. Telephone Co., Carbondale, Ill.

Use Klein Tools for constant success—send 3 cents for postage for 65-page catalogue of the Klein kind.

Mathias Klein & Sons,
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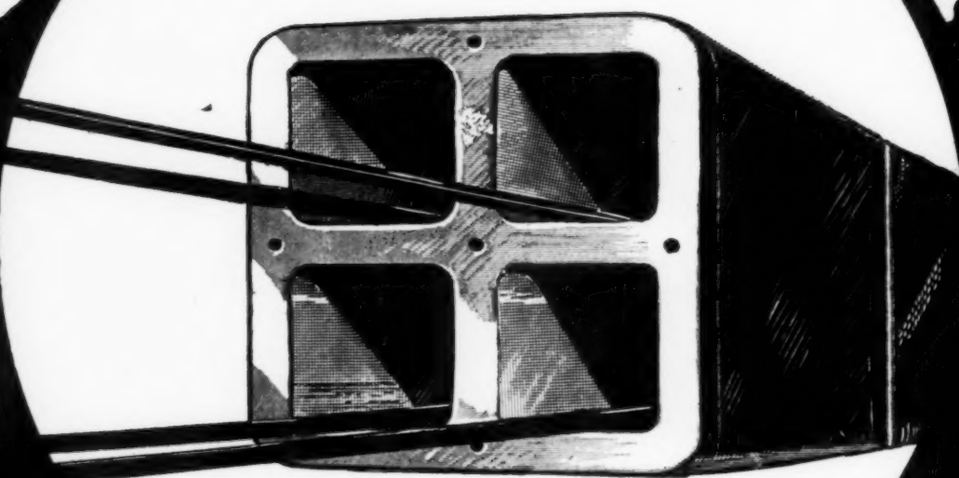
CAMP-DUCT



THE BEST UNDERGROUND CONDUIT

since the spirit of Economy first led men to take wires down from exposed poles to put them under the earth. "CAMP QUALITY" = Dependability, Durability, Economy.

The H. B. CAMP COMPANY

MANUFACTURERS OF VITRIFIED CLAY CONDUITS

FLAT IRON BUILDING	FULTON BUILDING	THE ROOKERY
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Over 25,000 Lines of Automatic Telephone Equipment Sold in the Last 60 Days

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Helena, Montana.	Pocatello, Idaho.
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Additions to Existing Automatic Plants

Los Angeles, California	6,000 Lines
Butte, Montana	300 "
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Bellingham, Washington	100 "
Grand Rapids, Mich.	1,000 "
Omaha, Nebraska	800 "
Sioux City, Iowa	1,000 "
Oakland, California	500 "
Columbus, Ohio	1,000 "
Portland, Oregon	1,600 "
Lincoln, Nebraska	200 "
Akron, Ohio	500 "
Edmonton, Alberta, Can.	500 "
Van Wert, Ohio	100 "
Aberdeen, S. D.	100 "
Saskatoon, Sask., Canada	100 "

Automatic Electric Company

Van Buren and Morgan Streets **CHICAGO, U. S. A.**

The Leading Storage Battery Practice of America and Europe

is at your command in The "Chloride Accumulator."

The Electric Storage Battery Company interchanges data, inventions and ideas with the leading makers of England and Continental Europe.

21 years' experience as the largest maker supplemented by the best experience of the foreign leaders.

The use of The "Chloride Accumulator" is nearly universal for Common Battery Telephone Exchanges.

Ask the nearest Sales Office for details. Our Engineering Staff is at your command.

THE ELECTRIC STORAGE BATTERY CO.

1888 1909

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Automatic Electric Co.

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Nungesser Electric Battery Co.
Western Electric Co.

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Electric Storage Battery Co.

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Fuse Wire.
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Western Electric Co.

Guy Anchors.
Everstick Anchor Co.
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Automatic Electric Co.
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Brookfield Glass Co.

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American Electrical Works.
Indiana Steel & Wire Co.
Roebling's Sons Co., John A.

Wire, Strand.
American Electrical Works.
Indiana Steel & Wire Co.
Phillips Insulated Wire Co.
Roebling's Sons Co., John A.

Wire, Weatherproof.
Atlantic Insulated Wire & Cable Co.
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Safety Insulated Wire & Cable Co.
Simplex Electrical Co.

SAFETY

SEAMLESS RUBBER SAFETY INSULATIONS

RUBBER INSULATED
TELEPHONE WIRES and CABLES
for Inside, Aerial, Underground or Submarine Service

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High or Low Tension
Light and Power Cables

THE SAFETY INSULATED WIRE & CABLE COMPANY
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SPECIAL SUBSCRIPTION PROPOSITION
It offers something worth while
TELEPHONE ENGINEER MONADNOCK BLDG., CHICAGO

PUBLISHERS' ANNOUNCEMENT

Date of Publication

¶ Telephone Engineer is issued and mailed on the first day of each month.

Inquiries From Subscribers

¶ Telephone Engineer invites inquiries from its subscribers relating to all subjects of interest—technical, financial, ethical or otherwise. All such inquiries will have prompt attention.

Advertisers

¶ Telephone Engineer solicits your printed matter for its permanent catalogue files. It will form a reference library for visitors to our offices and serve useful purposes to our mutual advantage.

Back Numbers

¶ Telephone Engineer cannot furnish back numbers. Subscribers will profit by preserving their copies. These early numbers are already in great demand.

Books

¶ Telephone Engineer will undertake to supply any technical book upon receipt of the retail price. In most cases this will also cover the prepayment to destination.

General

¶ Telephone Engineer wants to keep in close touch with its readers everywhere and to put them in close relationship with each other, serving as a clearing house for the interchange of up-to-the-minute ideas. Address all communications to

TELEPHONE ENGINEER

Monadnock Bldg. CHICAGO

QUALITY

There are a great many details that have to be considered in making wire joints of quality; one of the important ones is

COPPER

The majority of people think that copper is copper, the same as a few years ago telephone men thought that iron wire was iron wire; but today we know that there are special grades of wires, especially compounded to meet the duty required of them, such as BB, EBB, etc., so it is with copper. In making our bevel edged joints we use a 90% pure copper. Extra tough and especially annealed; each separate width from which joints are made being particularly selected for the service required of it. It must be just the right degree of hardness, not so hard that it will crack when twisted or so soft that it will bend and damage in the tool kit. The grain must be close so that it forms a tight waterproof covering for your wires, not porous, which might have a tearing tendency. All the copper used in Harvard Bevel Edged Copper Self Welding wire joints is the result of years of experience and experimenting and is one of the reasons why our joints look so well and give such great efficiency which has made them

THE STANDARD OF THIS COUNTRY

This care in selecting just the right copper and other painstaking methods may make them cost a trifle more, but if you want good joints specify them to your dealer or direct from us

HARVARD ELECTRIC CO.

66 W. VAN BUREN ST. CHICAGO — MFRS. — 136 LIBERTY STREET NEW YORK

McROY

STANDARD
VITRIFIED CLAY

CONDUITS

ARE THE KIND
THAT OTHER
COMPANIES TRY
TO MANUFACTURE

McROY CLAY WORKS

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This offer is good till November 1, 1909.

Telephone Engineer

Monadnock Building

Chicago.

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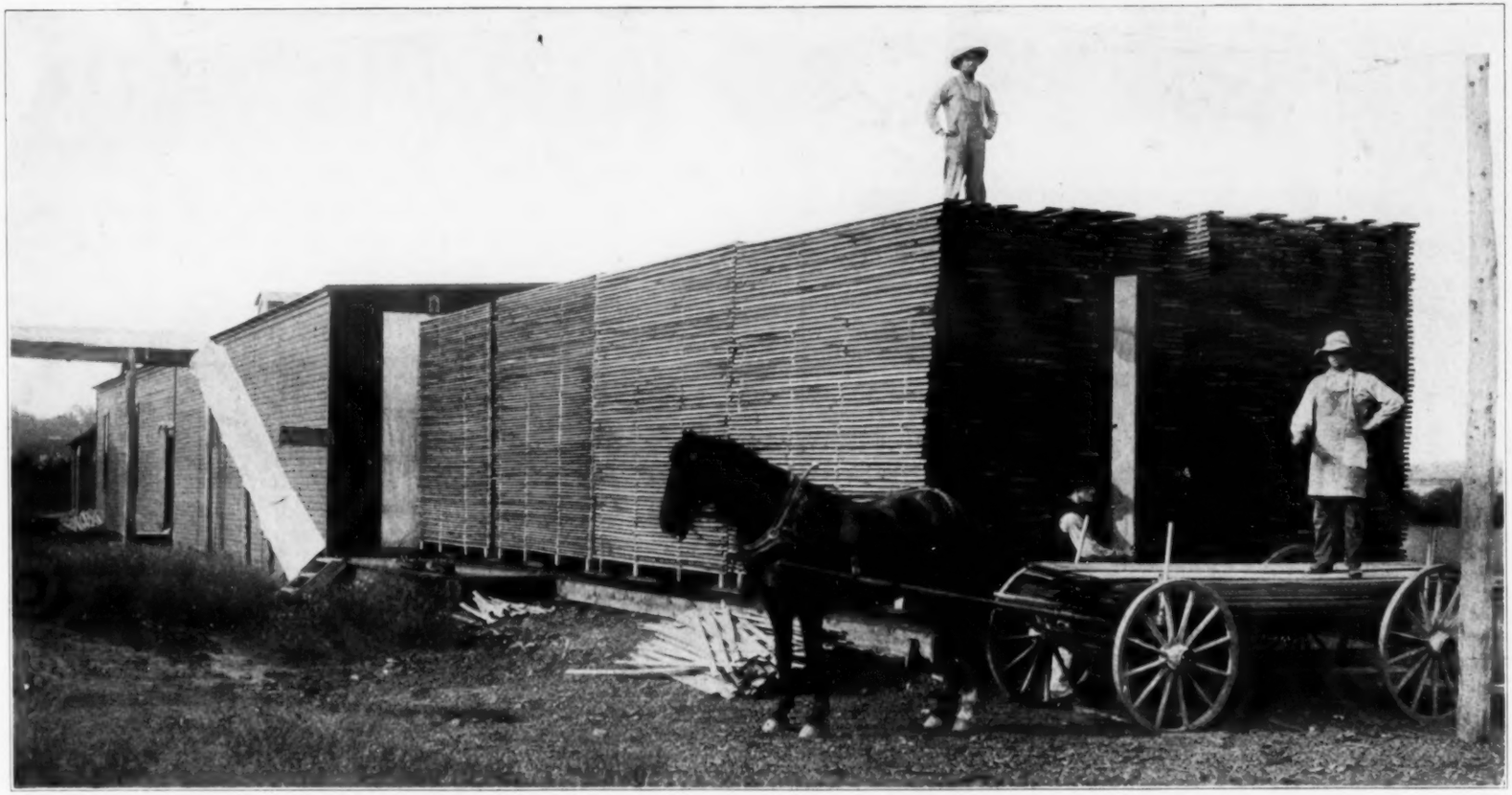
KELLOGG TELEPHONES and SWITCHBOARDS



The Very Best Lumber Obtainable Going Into the Kiln of Our Woodworking Plant

¶ We know of no better way of emphasizing the long-service qualities in our apparatus

¶ We know of no better way of emphasizing the long-service qualities in our apparatus than referring prospective purchasers to Kellogg telephones and switchboards giving splendid service two, five, eight and more years after they have been installed.

¶ We are proud of the fact that our customers are our best advertisement.

¶ While all of our readers cannot make actual inspection of operating Kellogg exchanges, we can show on these pages why our telephones have superior service records, by showing how they are built, from the beginning where the rough lumber is unloaded at our complete woodworking plant until our telephones are connected to the line in the working exchange system.

¶ We do not buy the boxes, or cabinets, or receivers, or generators; we make them all —from the start to finish; and that we make them right is evidenced by the way Kellogg apparatus serves—in the severe daily—monthly—yearly operation in every class and size of exchange. In succeeding issues we will show views of our telephone and switchboard woodworking processes—the careful steps that combine to make the apparatus that the name Kellogg stamps as the independent standard throughout the world.

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MANUFACTURERS OF HIGH GRADE

EXCHANGE SYSTEMS

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GET OUR PRICES ON POLES

DURABILITY

is the test of true economy in the use of galvanized telephone wire.

DURABILITY depends more than anything else upon the quality of the galvanizing.

Roebling Double Galvanized Telephone Wire

is a durable wire because it is protected by real galvanizing; given an extra heavy coating of the best zinc spelter applied by methods directed by the experience of more than half a century.

It costs a little more than ordinary galvanized wire. It is worth a great deal more.

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DRY BATTERIES

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TELEPHONE DESK SET
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THE SIMPLEST!
THE MOST EFFICIENT AND MOST DURABLE
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DESK
SET
MADE

"BELL"
QUALITY

THERE ARE OVER
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Western-Electric Telephone Desk Sets

in use in this country. The absence of complicated detail in construction makes them the most reliable and economical Desk Sets for every kind of SERVICE. Every responsible telephone company may secure a Western Electric "Bell" Grade Desk Set for free trial by writing our nearest house.

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Boston	Cincinnati		Denver	Seattle
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NORTHERN ELECTRIC AND MANUFACTURING CO., Ltd.
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KERITE

INSULATED WIRES AND CABLES

KERITE has back of it an unequalled record of half a century of successful service under the most adverse conditions. It improves instead of deteriorating with age.

Efficiency and safety in electrical installations depend chiefly on insulation. For fifty years KERITE insulation has been the standard of excellence.

Results count. KERITE wires and cables installed half a century ago are in service to-day. The wonderful durability of KERITE insures the highest safety and economy.

Initial tests determine the properties of an insulation only at the time they are made. They do not determine how well it will do its work years afterward.

The indestructibility of KERITE and its power to resist deteriorating influences should be carefully considered in specifying an insulated wire or cable.

Experience of others should be useful to you. Insure your service by using KERITE.

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Western Representative
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Get additional pins for new toll lines with

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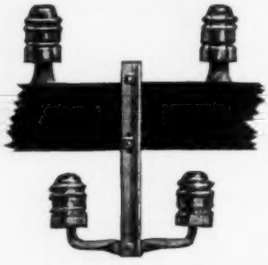

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(Ask for Bulletin No. 7)

LOOK FOR THE SPRING THREAD

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Bare Copper Wire and Cable
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For Power, Telephone and Telegraph

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PAYS FOR ITSELF IN THE SAVING OF POLES, CROSS-ARMS AND LINE MATERIAL WHICH IT EFFECTS

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Our output this year will exceed 6000 car loads.

Western-Electric Telephone Cable means HIGHEST QUALITY and FAIR PRICES.

Do not fail to get our prices before placing your orders. Write our nearest house.

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New York	Chicago	**Manufacturer of all Telephone Apparatus used by the entire "Bell" System**	St. Louis	San Francisco
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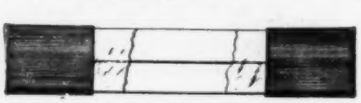
"AMERICAN"

Patent "ENCLOSED" Mica Fuses

SAFEST AND MOST RELIABLE FUSES MADE

No Shellac  No Glue

American "Patent" Enclosed Mica Fuse

The **Fuse** wire **hangs loosely** between **two Mica Strips**. The **Strips** can be **bent** or **broken**, but the **Fuse** wire remains **intact.** No matter how **roughly** the Fuse is **handled** the fuse wire will not become **broken.**

:: EVERY FUSE GUARANTEED TO BE GOOD ::

AMERICAN ELECTRIC FUSE CO.

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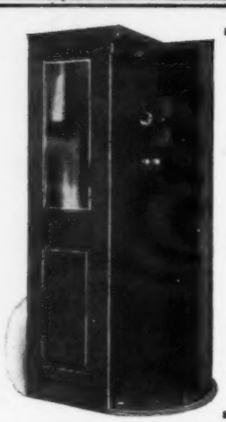

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The Anchor of Merit

Cuts show two-way and four-way Everstick Anchors closed and expanded.

Largest companies in the United States are using Everstick Anchors successfully, and thousands of them.

Write for prices and descriptive booklet.

The EVERSTICK ANCHOR CO.
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WE ARE PRODUCERS AND SHIPPERS OF

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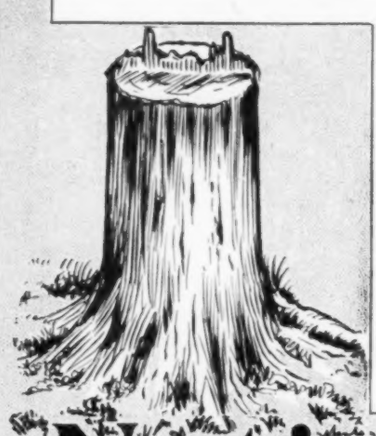
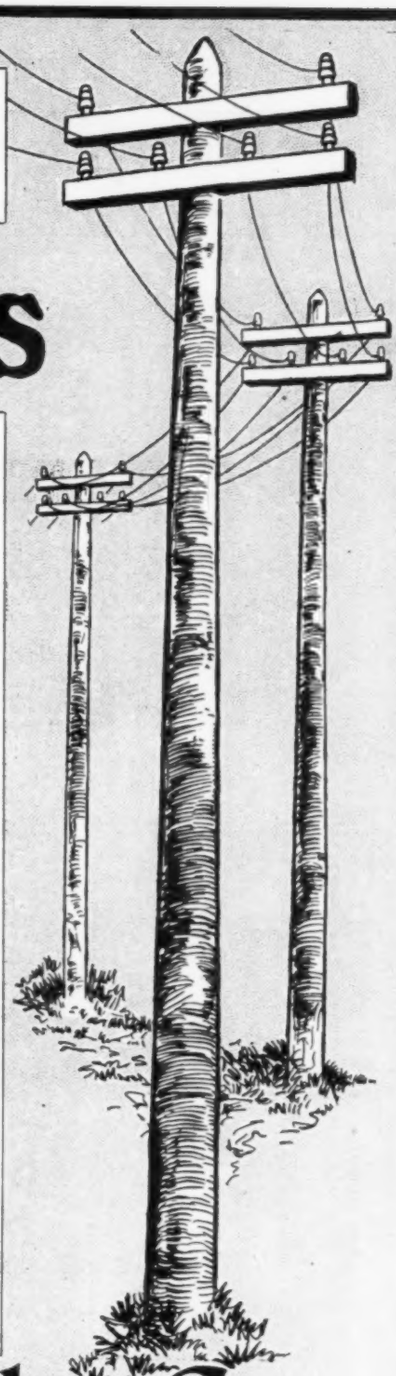
"From the Stump to the Line"

We carry large stocks of poles at various points in the states of Michigan, Wisconsin, Minnesota, Idaho, Washington and Maine, and are in a position to make immediate shipment at lowest prices and freight rates.





National Pole Co.

Successors to the Cedar Department of the Pittsburg & Lake Superior Iron Company

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RUBBER INSULATED
TELEPHONE
WIRES
AND
CABLES

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For Electrical Purposes

ANY SIZE :: :: ANY SPECIFICATION

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For the Electrical Department of Railroad Construction and Maintenance

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Should be the first consideration in the selection of tools. Poor quality is the birth of rich expense.

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With quality, is the foundation stone of successful construction and economical maintenance.

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Have gained a reputation for Quality and Utility, and they have recommended themselves so that now they are in use practically everywhere.

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Have our catalogue on file for ready reference, and specify KLEIN TOOLS.

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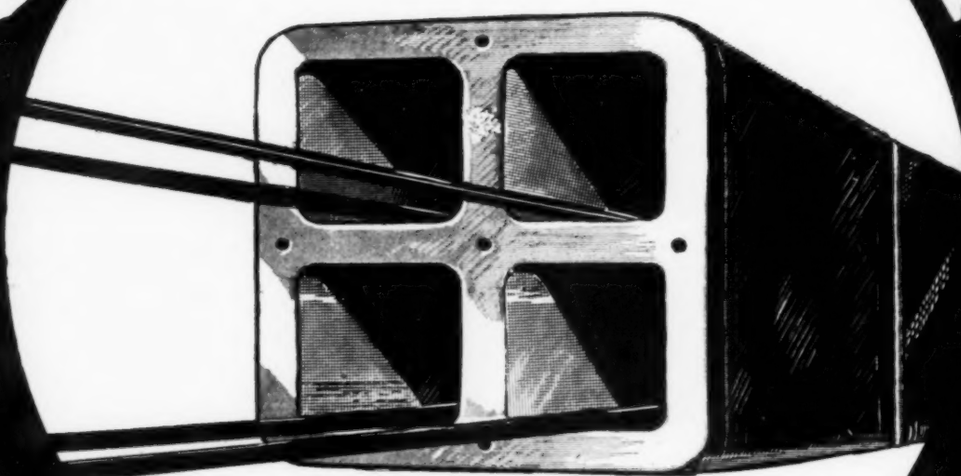

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since the spirit of Economy first led men to take wires down from exposed poles to put them under the earth. "CAMP QUALITY" = Dependability, Durability, Economy.

The H. B. CAMP COMPANY

MANUFACTURERS OF VITRIFIED CLAY CONDUITS

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THE ROOKERY
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AUTOMATIC TELEPHONE APPARATUS

now produced by us is the result of

TWENTY YEARS' DEVELOPMENT

by this Company and its predecessors

The best Engineers money could procure (some of whom have devoted more than fifteen years of their lives to this work) have perfected our telephone apparatus.

The Most Elastic in Its Application

The Most Efficient Service Producer

The Most Economical to Maintain and Operate

If you are not-satisfied with your present earnings,
If your patrons are dissatisfied with your service,
If you want to EXTEND your present plant or build a NEW ONE and effect a MATERIAL SAVING IN COST,

WRITE US WHAT YOU HAVE IN MIND

We Can Help You and Will Gladly Discuss the Matter Fully With You

Automatic Electric Company

CHICAGO

21 Years' Experience in Building Storage Batteries

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It's a large record at the top. The "Chloride Accumulator" is used exclusively by the leaders—by practically all the common Battery Telephone Exchanges.

The larger quantity of business permits of constant research work and the maintenance of 2 laboratory tests—one on all raw material coming in and the second on each day's run before it can go out.

Quantity and Quality are interdependent.

Write the nearest Sales Office for Engineering data and suggestions.

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Brookfield Glass Co.

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Wire, Galvanized Iron.
American Electrical Works.
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Wire, Strand.
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Safety Insulated Wire & Cable Co.
Simplex Electrical Co.

$10 REWARD

A REWARD of $10 will be paid by the undersigned for information leading to the apprehension of T. O. Thomas, who, while acting as relief manager at our exchange at Kennett, Missouri, absconded on August 17, 1909, with about $80 of this company's money. Is about 5 ft. 8 in. in height, dark complexion and black hair, probably 30 to 33 years of age. Dresses neatly; talks boastingly, and claims to have been a telephone man for eighteen years. We understand that he was at one time in the employ of the New York & New Jersey Telephone Company at Newark, N. J., and that he has also worked in the south—probably in Tennessee and South Carolina. We will appreciate any information, of whatever nature, concerning this man. Write, or wire at our expense, Southeast Missouri Telephone Company, Charleston, Mo.

Bare and Insulated Wires

BARE COPPER WIRE,
"O.K." WEATHER PROOF WIRE,
WEATHER PROOF IRON WIRE,
"PARAC" RUBBER WIRE,
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WIRE

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OF HIGHEST QUALITY

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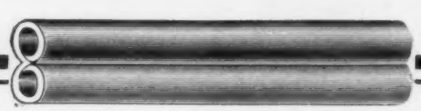

QUALITY

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COPPER

The majority of people think that copper is copper, the same as a few years ago telephone men thought that iron wire was iron wire; but today we know that there are special grades of wires, especially compounded to meet the duty required of them, such as BB, EBB, etc., so it is with copper. In making our bevel edged joints we use a 90% pure copper. Extra tough and especially annealed; each separate width from which joints are made being particularly selected for the service required of it. It must be just the right degree of hardness, not so hard that it will crack when twisted or so soft that it will bend and damage in the tool kit. The grain must be close so that it forms a tight waterproof covering for your wires, not porous, which might have a tearing tendency. All the copper used in Harvard Bevel Edged Copper Self Welding wire joints is the result of years of experience and experimenting and is one of the reasons why our joints look so well and give such great efficiency which has made them

THE STANDARD OF THIS COUNTRY

This care in selecting just the right copper and other painstaking methods may make them cost a trifle more, but if you want good joints specify them to your dealer or direct from us

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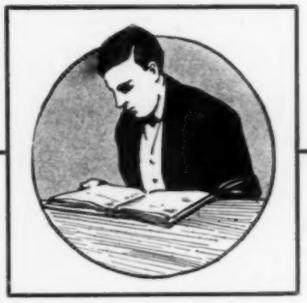
Factory: Brazil, Ind.



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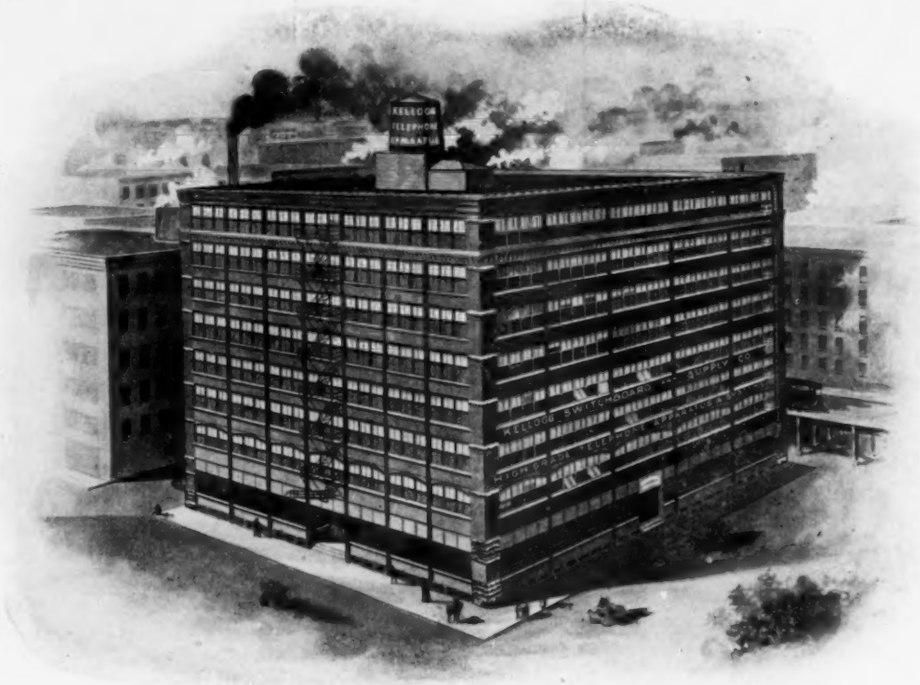
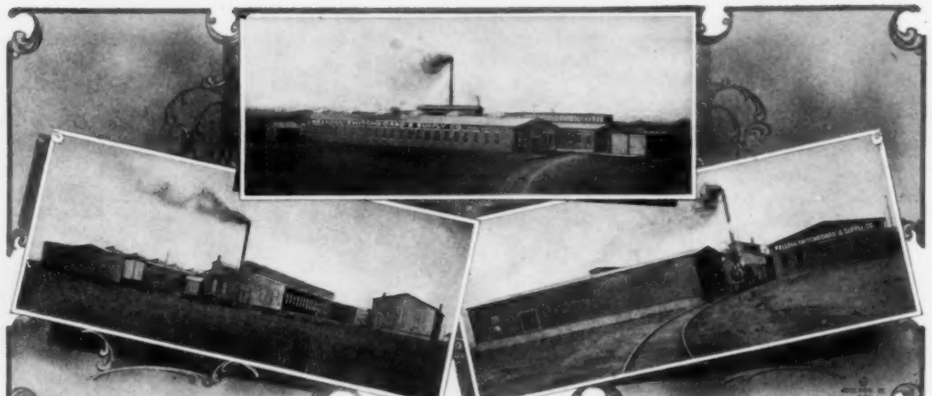


The Kellogg Main Factory



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IF IN THE MARKET FOR POLES ═══ GET OUR PRICES

Kellogg Telephones AND Switchboards

Kellogg telephones and switchboards are Kellogg from box to switch-hook and from cabinet to jack strip. Not picked up here and there, half manufactured, half bought, or fitted out with untried novelty parts or attachments that often make operation complicated and uncertain.

Kellogg telephones are built from start to finish in our own factory.

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Two warehouses, 41,000 square feet, hold the raw material and line supplies, arranged for quick assembling and filling of every order, large or small. We consider the prompt shipment of an order as important as the correct filling of it.

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If you are interested in telephones and switchboards, send for our illustrated bulletins. If you wish advice or information on any phase of exchange management, write our Engineering Department. Our long experience in every line of telephone and switchboard installation may be of value to you in determining problems of economical operating management. :: :: ::

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Manufacturers of—Complete Exchanges—Line Supplies—Wire

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DURABILITY depends more than anything else upon the quality of the galvanizing.

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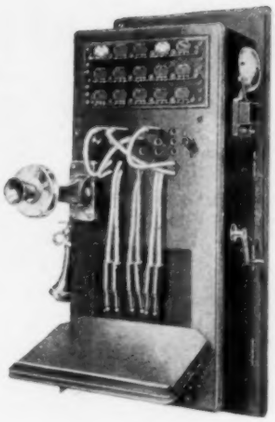

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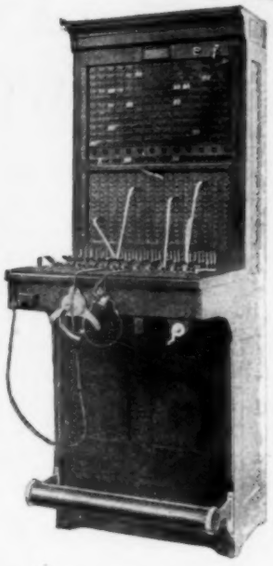

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No. 106 SWITCHBOARD

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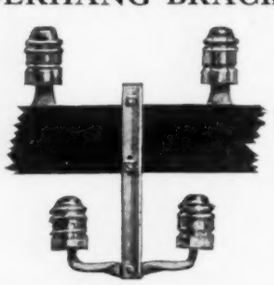
They Bolt AROUND the Arm



They Bolt AROUND the Arm

Attached or removed in a minute

(Ask for Bulletin No. 7)

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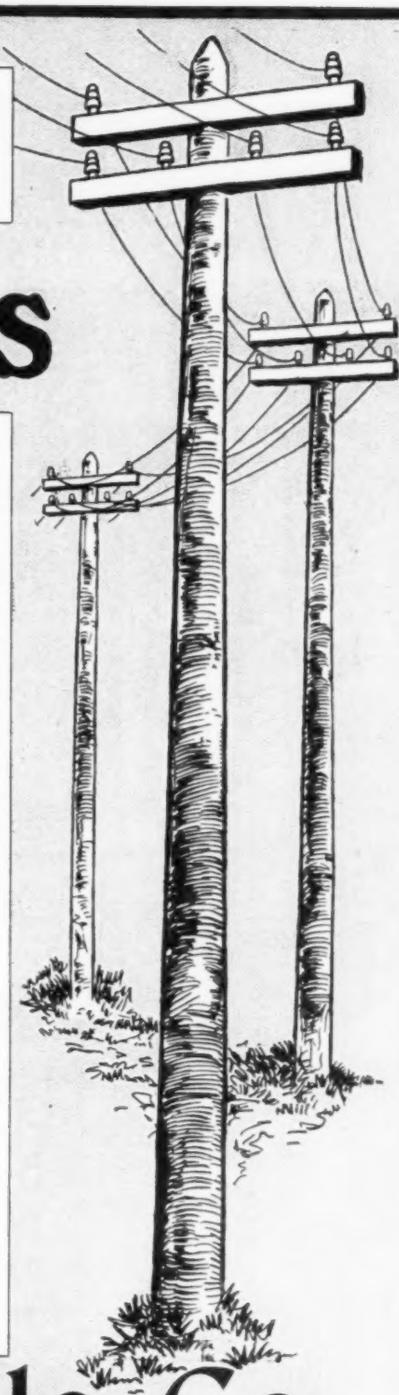

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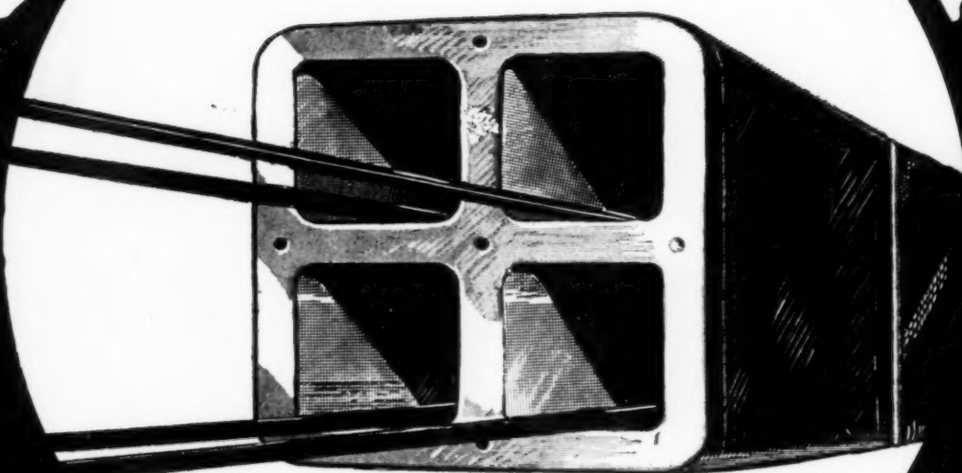

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Automatic Electric Company

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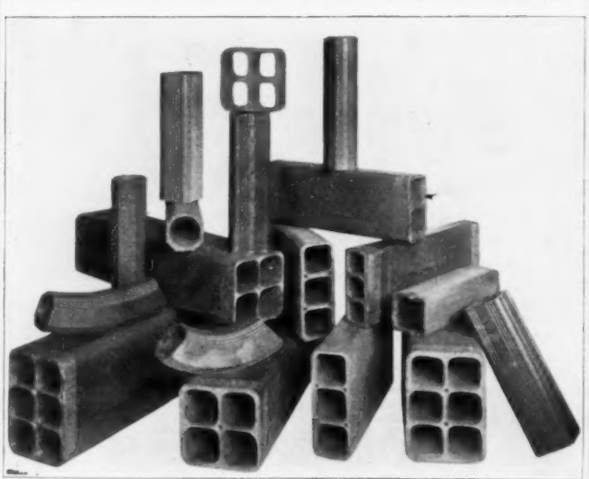

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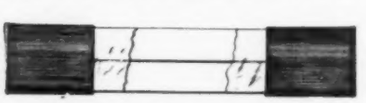

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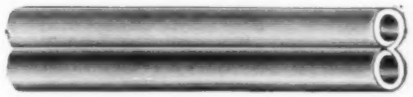
Self Welding



and compare them with what you have been using from the standpoints of price, efficiency, or durability, and you will specify bevel edge joints in your next order.

Other Joints Before twisting | Other Joints After twisting | Harvard Joints Before twisting | Harvard Joints After twistin

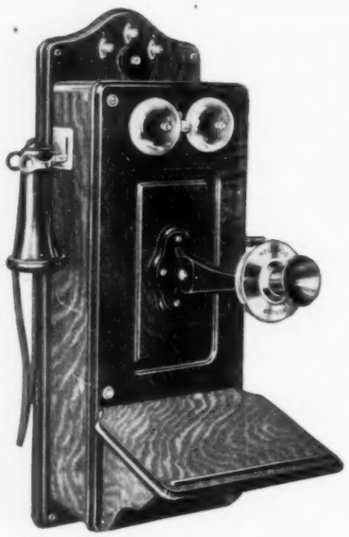
Harvard Electric Company

525 W. Van Buren St. CHICAGO

136 Liberty Street NEW YORK

The Lineman and the Kellogg Telep ho

KELLOGG TELEPHONES TRANSFORM TRO UB



STANDARD KELLOGG MAGNETO TELEPHONE

Joseph's Mills, Tyler Co., W. Va.
February 23, 1909.

Kellogg Switchboard & Supply Co.,
Chicago, Illinois.

Gentlemen:—

I wish to express my kindest regards in behalf of the 5 Kellogg telephones, ordered Jan. 6th, 1909. I without hesitancy will say they are the best telephones that ever entered this section of West Virginia, and have received more comments from the public in general. The tick of a watch was distinctly heard a distance of 58 miles and 13 miles of that distance was grounded circuit in bad condition, and the remainder metallic through two switchboards. I have been in the telephone field for the past fifteen years and they are superior to all makes of telephones that I have ever seen. I do not think they can be over-estimated, as they stand faultless and without question.

So please find remittance for $———— for————more telephones, and I shall make it my utmost effort to introduce the Kellogg apparatus throughout this section of the country.

Wishing the Kellogg Switchboard & Supply Co. the greatest success possible,

Yours very truly,

CHAS. SMITH, Mgr.
NORTH BEND & SOUTHERN TELEPHONE CO.

KELLOGG SWITCHBOARD & SUPPLY CO.

CHICAGO

KANSAS CITY SAN FRANCISCO WINNIPEG, CANADA

OUR BULLETINS MAILED PROMPTLY ON REQUEST

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THE letter on the opposite page is only one of the many we receive constantly from enthusiastic customers throughout the country.

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Have you seen our new Illustrated Magneto Telephone Bulletin (No. 38)?
If not, fill out blank below, tear off and mail to us.

Kellogg Switchboard & Supply Co.,

GENTLEMEN:
Please send me by return mail your Illustrated Bulletin describing your standard Magneto Telephones.

Yours Truly,

NAME .....

ADDRESS .....

DURABILITY

is the test of true economy in the use of galvanized telephone wire.

DURABILITY depends more than anything else upon the quality of the galvanizing.

Roebling Double Galvanized Telephone Wire

is a durable wire because it is protected by real galvanizing; given an extra heavy coating of the best zinc spelter applied by methods directed by the experience of more than half a century.

It costs a little more than ordinary galvanized wire. It is worth a great deal more.

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Efficiency and safety in electrical installations depend chiefly on insulation. For fifty years KERITE insulation has been the standard of excellence.

Results count. KERITE wires and cables installed half a century ago are in service to-day. The wonderful durability of KERITE insures the highest safety and economy.

Initial tests determine the properties of an insulation only at the time they are made. They do not determine how well it will do its work years afterward.

The indestructibility of KERITE and its power to resist deteriorating influences should be carefully considered in specifying an insulated wire or cable.

Experience of others should be useful to you. Insure your service by using KERITE.

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Sole Manufacturer

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Railway Exchange, CHICAGO, ILL.

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Pocket Ammeters and Voltmeters with INDESTRUCTIBLE METAL DIALS more accurate than other makes with hand drawn scales.
Permanent magnet type, indicates polarity as well as current. Guaranteed for one year.

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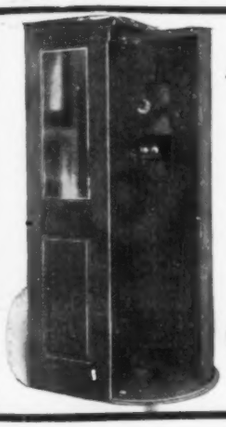

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No. 1317 SET CLOSED

OVER 6,000,000 WESTERN IN USE

Our new No. 1317 type magneto telephones can be depended upon to render the most efficient service under the most exacting conditions and at the minimum of maintenance expense.

WHY EXPERIMENT?

There is a reason in every detail of the No. 1317 type telephone why it should be specified for every kind of magneto service either on short local lines or long farmers' lines.

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Every responsible telephone company may secure one for thirty days' free trial. Write our nearest house, state the condition of service to be met and we will send you by prepaid express a telephone which you may examine and test as you see fit. A personal examination of these sets at our expense will show you why Western Electric telephones are the standard of the world.

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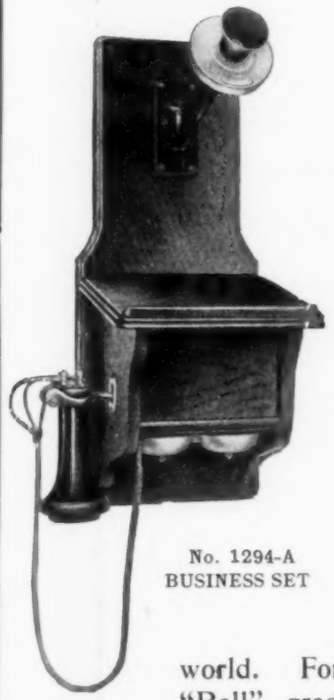

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Western Electric telephones have made possible the efficient local and long distance telephone service of the world.

They are the development of the foremost Telephone Engineers.

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THE HIGH QUALITY

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On the quality of your apparatus depends the dividend earning power of your system.

Western Electric telephones reduce operating expenses. Write our nearest house for Bulletin No. 4364. It describes our standard sets fully.

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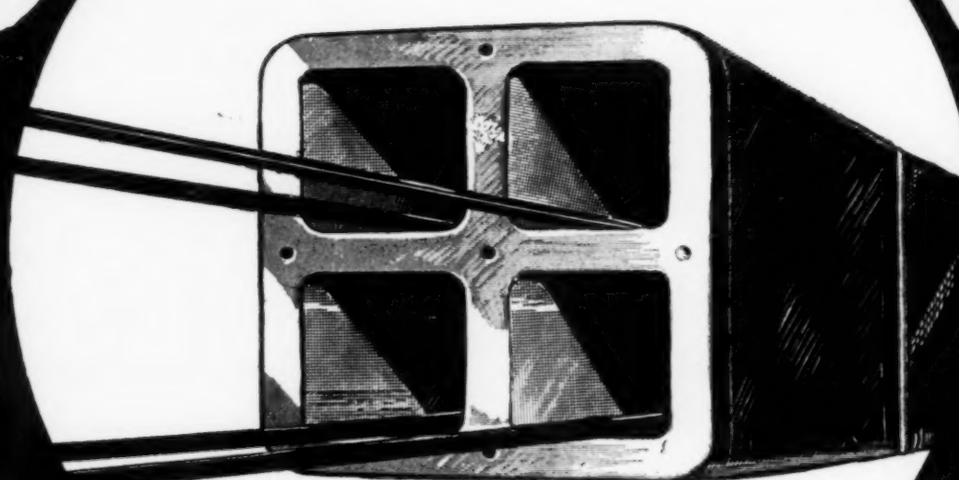

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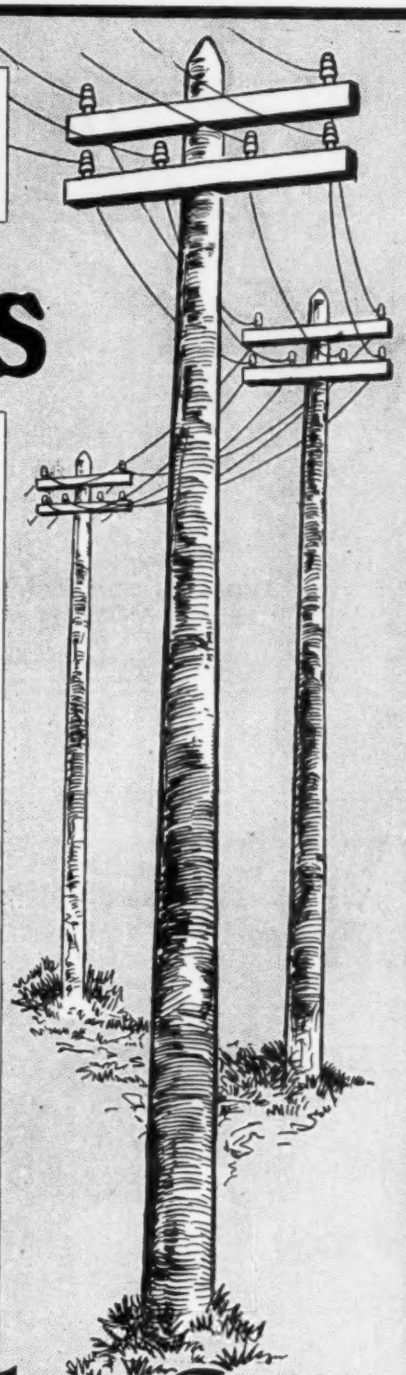

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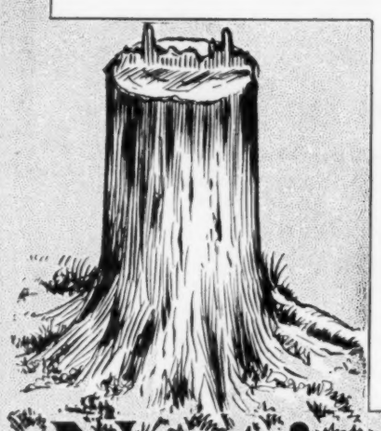
We carry large stocks of poles at various points in the states of Michigan, Wisconsin, Minnesota, Idaho, Washington and Maine, and are in a position to make immediate shipment at lowest prices and freight rates.



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Successors to the Cedar Department of the Pittsburg & Lake Superior Iron Company

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Have gained a reputation for Quality and Utility, and they have recommended themselves so that now they are in use practically everywhere.

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The Most Economical to Maintain and Operate

If you are not satisfied with your present earnings,
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If you want to EXTEND your present plant or build a NEW ONE and effect a MATERIAL SAVING IN COST,

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We Can Help You and Will Gladly Discuss the Matter Fully With You

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The "Chloride Accumulator"

If it wasn't the best for Common Battery Telephone service it would not be so overwhelmingly adopted by all the leaders

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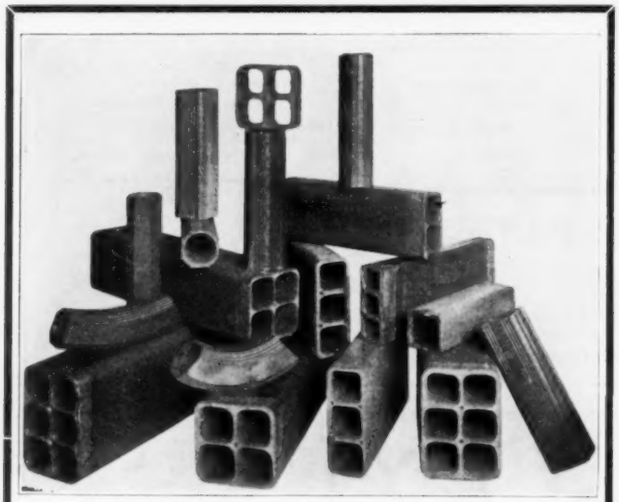

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The Rookery

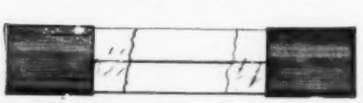
Chicago

"AMERICAN"

Patent "ENCLOSED" Mica Fuses

SAFEST AND MOST RELIABLE FUSES MADE

No Shellac



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American "Patent" Enclosed Mica Fuse

The **Fuse** wire **hangs loosely** between **two Mica Strips**. The **Strips** can be **bent** or **broken**, but the **Fuse** wire remains **intact.** No matter how **roughly** the Fuse is **handled** the fuse wire will not become **broken.**

:: EVERY FUSE CUARANTEED TO BE COOD ::

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Other Joints After twisting

COST

Harvard Joints After twisting

means several things not usually thought of in the purchasing of articles, and one of the most important of these overlooked conditions is

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HARVARD BEVEL EDGED SELF WELDING WIRE JOINTS

give strength, they save labor, they reduce maintenance and they increase efficiency. They are not a new fangled device which requires a special tool or even special knowledge or workmen. It is just as easy for a helper to make a good joint with them as for the skilled wire man—you can't make a bad joint with them. And the price is no higher. Think of the saving. Send for the free samples.

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of satisfactory service
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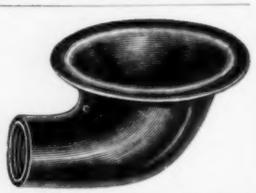

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Are the Best

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TALK THROUGH KELLOGG TRANSMITTERS

DAILY

WHAT BETTER PROOF of THEIR SUPERIORITY COULD WE GIVE?

THE HIGHEST GRADE

OF WORKMANSHIP AND MATERIAL IS
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There are today over seven hundred thousand in operation and giving satisfaction, as every Kellogg Customer understands.

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Kansas City **San Francisco**

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is the test of true economy in the use of galvanized telephone wire.

DURABILITY depends more than anything else upon the quality of the galvanizing.

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is a durable wire because it is protected by real galvanizing; given an extra heavy coating of the best zinc spelter applied by methods directed by the experience of more than half a century.

It costs a little more than ordinary galvanized wire. It is worth a great deal more.

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Anchors	Guy Wire	Screws
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We carry at all times a complete stock of line supplies and construction material, and pay the same careful attention to prompt shipment that we do to the correct filling of your order.

BEFORE YOU BUY GET OUR PRICES ON POLES. WE ARE NOT JOBBERS, BUT PRODUCERS AND CUT OUR OWN POLES IN MICHIGAN

WRITE FOR OUR LINE SUPPLY CATALOGUE

KELLOGG SWITCHBOARD & SUPPLY COMPANY

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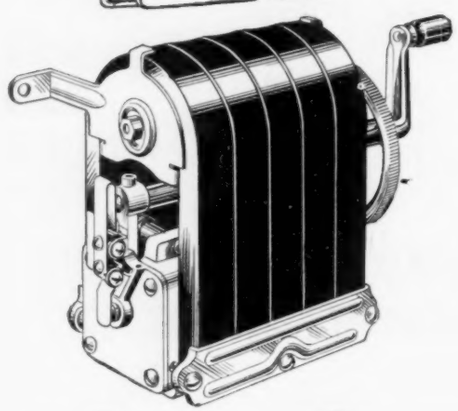
PERFECTION OF DETAIL PROVES

No. 1317 TYPE TELEPHONES

The No. 1317 Type Telephones

Represent the last word in perfection of design, efficiency and durability.

There is a reason in every detail of these expense reducing telephones why they should be adopted by every telephone company for every scheme of magneto service.



The New No. 48 Generator

This five-bar Generator is the strongest—the most efficient—made. The armature is normally shunted from the line (cannot be injured by lightning). The act of turning the crank automatically connects the Generator to the line, and the armature is automatically cut off again when the crank is released. The magnets are of special steel and hardened by a special process to insure permanent strength.

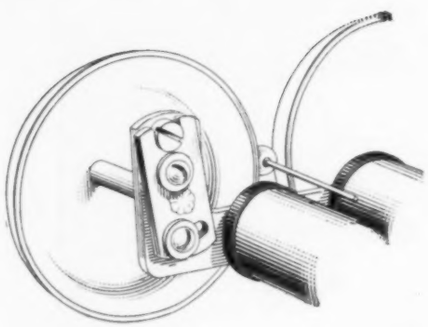
The No. 38 Type Ringer

Is specially designed for use with the No. 1317 set. It has two large 3-inch brass gongs which are about 50% louder than any others on the market.

The main features of this Ringer are covered by United States and foreign patents and can be supplied only with our sets.

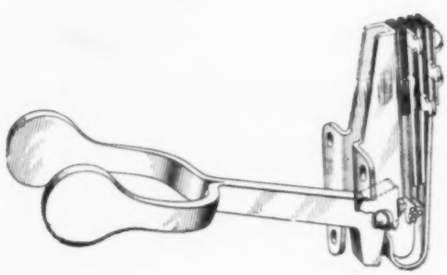
Western-Electric

EFFICIENT AND DURABLE



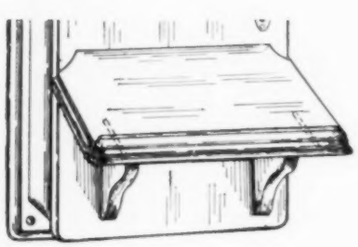
This cut shows how simple it is to adjust the gongs of the No. 38 Type Ringer.

Just an ordinary screw driver is all that is needed. It is the absence of complicated detail in Western Electric Telephones which makes for low maintenance expense.



The No. 140 Type Switch Hook

Is used with our No. 1317 telephone set. It is a one-piece hook. Compact and self contained. The springs are mounted vertically to prevent dust settling on them. The contacts are of platinum and all current carrying parts are insulated from the frame.



Cabinet Construction

Note our method of reinforcing the Writing Shelf, by inserting two hardwood dowel pins at that point in the shelf which is subjected to the most pressure.

Such Maintenance Reducing Features as These Make Western Electric "Bell" Grade Telephones the Standard of the World.

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TELEPHONE WIRE

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Handled by Leading Supply Houses or Sold Direct.

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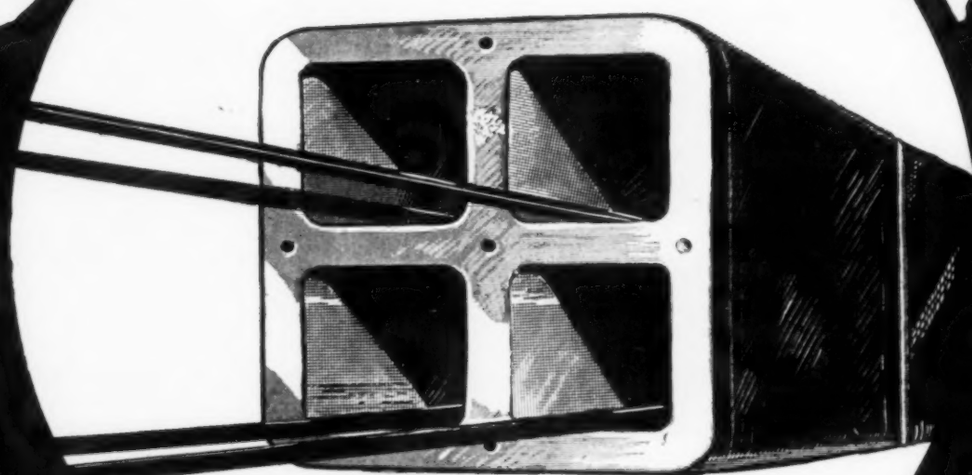
CAMP-DUCT



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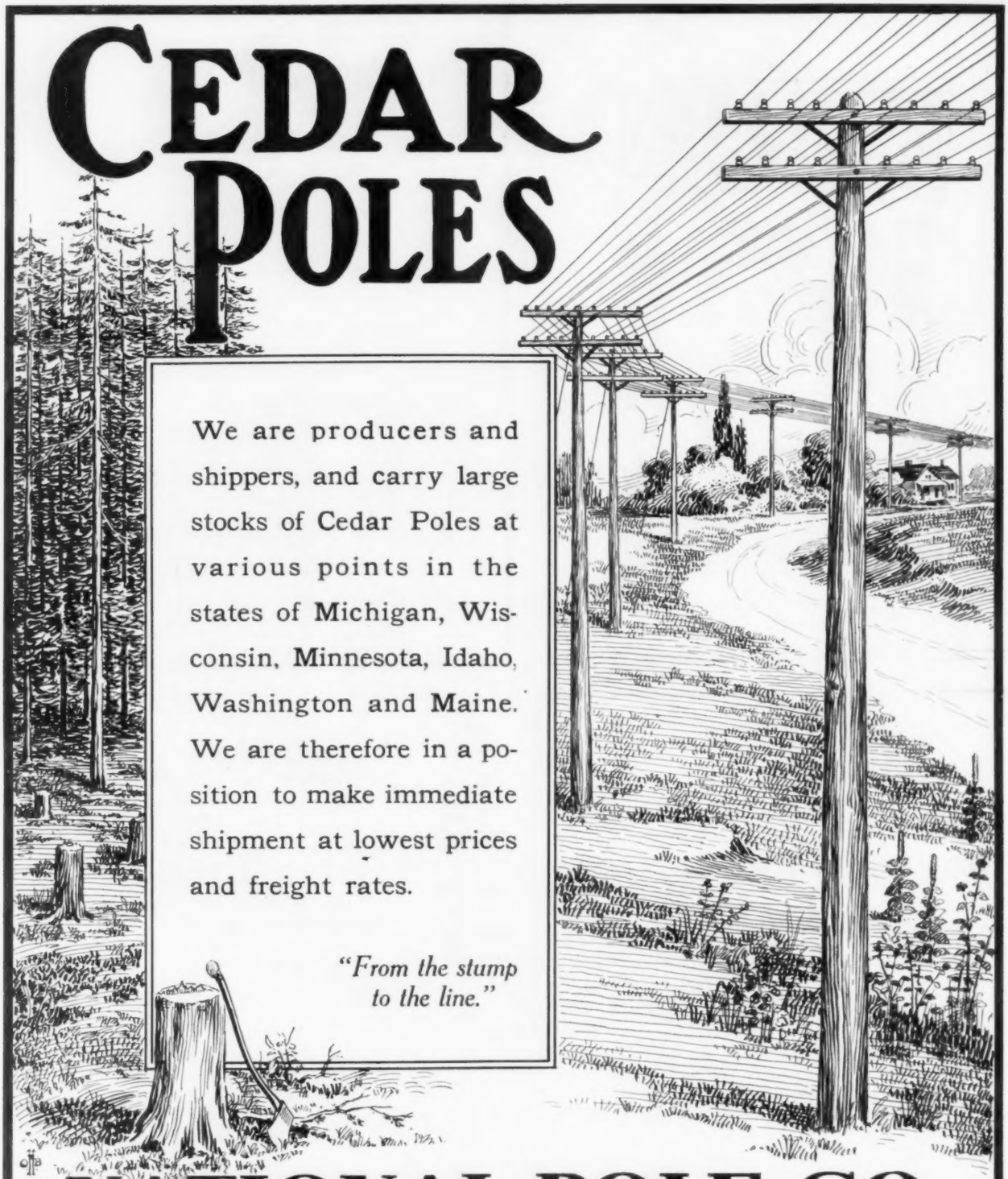

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The Most Elastic in Its Application

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The Most Economical to Maintain and Operate

If you are not satisfied with your present earnings,

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If you want to EXTEND your present plant or build a NEW ONE and effect a MATERIAL SAVING IN COST,

WRITE US WHAT YOU HAVE IN MIND

We Can Help You and Will Gladly Discuss the Matter Fully With You

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